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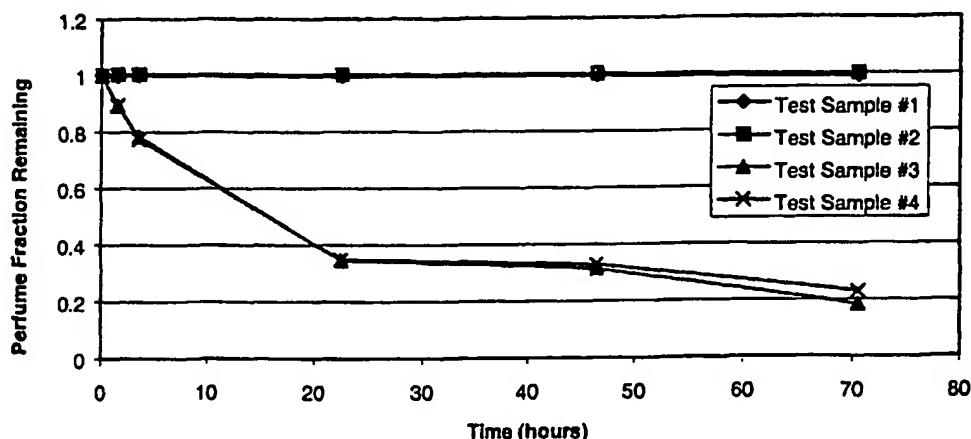
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(54) Title: CLEANING SHEETS HAVING LONG-LASTING PERFUME ODOR



(57) Abstract: Cleaning sheets having long-lasting perfume odor comprise a substrate, perfume, and additive material having a melting point of at least about -15°C, wherein the perfume and additive material are affixed to the substrate. In a preferred embodiment, the perfume and additive material are first blended together and then affixed to the substrate, such that the blend of perfume and additive material has a melting point of at least about 20°C. Methods of imparting perfume odor to a surface, and optionally removing dust or the like from the surface, comprise the step contacting, preferably wiping, the surface with a cleaning sheet of the present invention.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## CLEANING SHEETS HAVING LONG-LASTING PERFUME ODOR

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### TECHNICAL FIELD

The present invention relates to cleaning sheets that have a long-lasting perfume odor and  
10 that are particularly suitable for removal and entrapment of dust, lint, hair, sand, food crumbs,  
grass and the like from surfaces.

### BACKGROUND OF THE INVENTION

The use of nonwoven sheets for dry dust-type cleaning are known in the art. Such sheets  
typically utilize a composite of fibers where the fibers are bonded via adhesive, entangling or  
15 other forces. See, for example, U.S. Patent No. 3,629,047 and U.S. Patent 5,144,729. To provide  
a durable wiping sheet, reinforcement means have been combined with the staple fibers in the  
form of a continuous filament or network structure. See, for example, U.S. Patent No. 4,808,467,  
U.S. Patent 3,494,821 and U.S. Patent No. 4,144,370. Also, to provide a product capable of  
withstanding the rigors of the wiping process, prior nonwoven sheets have employed strongly  
20 bonded fibers via one or more of the forces mentioned above. While durable materials are  
obtained, such strong bonding may adversely impact the materials' ability to pick up and retain  
particulate dirt. In an effort to address this concern, U.S. Patent 5,525,397 to Shizuno et al.  
describes a cleaning sheet comprising a polymeric network layer and at least one nonwoven layer,  
wherein the two layers are lightly hydroentangled so as to provide a sheet having a low  
25 entanglement coefficient. The resulting sheet is said to provide strength and durability, as well as  
improved dust collecting performance because the composite fibers are lightly hydroentangled.  
Sheets having a low entanglement coefficient (i.e., not more than 500 m) are said to offer better  
cleaning performance because a greater degree of fibers are available for contact with dirt.

U.S. Patent No. 6,143,393 issued Nov. 7, 2000 to Abe et al. describes a cleaning product  
30 for collecting dust which comprises a base sheet and at least one layer of filaments or split yarns  
oriented in one direction, the base sheet and the layer are stacked and bonded together at a  
plurality of bonding lines extending in a direction intersecting with the one direction, and the base  
sheet is cut together with the layer intermittently in the intersecting direction between adjacent  
bonding lines to form cutting portions, thereby forming brushing portions with the layer. The

cleaning product preferably includes an oily agent, such as mineral oil, for easy adsorption of the dusts. In addition to the oily agent, the cleaning product can also incorporate with the oily agent materials such as deodorant, moistening agent, disinfectant, and cleaning chemical such as surfactant.

5           There remains, however, a desire to create a cleaning sheet that has a long-lasting perfume odor and that can impart a perfume odor to the surface being cleaned. Cleaning sheets having perfume odor tend to enhance the cleaning experience for consumers and make cleaning chores more pleasurable. As a result, consumers desire cleaning sheets that have perfume odor and that are able to impart a perfume odor to the surfaces being cleaned, such that the perfume  
10       odor permeates the consumers' environment.

#### SUMMARY OF THE INVENTION

          The present invention relates to cleaning sheets comprising a substrate, perfume, and additive material having a melting point of at least about -15°C, wherein the perfume and the  
15       perfume odor and are used to effectively pick-up and retain particulate material from surfaces, especially household surfaces. The present cleaning sheets can also impart a perfume odor to the surfaces being cleaned with the sheets.

          Perfumes tend to be comprised of relatively volatile materials, such that when perfume is affixed to a substrate, the perfume odor tends to be quickly lost over time. By affixing to the  
20       substrate a perfume along with an additive material having a melting point of at least about -15°C, the additive material helps to prevent the more volatile perfume raw materials from rapidly volatilizing from the substrate. It is preferred that the perfume and additive material are first blended together and then affixed to the substrate, such that the blend of perfume and additive material has a melting point of at least about 20°C. The resulting cleaning sheets of the present  
25       invention have a long-lasting perfume odor, even after being stored for relatively long periods of time.

          The present invention also encompasses a method of removing dust or the like from a surface comprising the step of contacting the surface with a cleaning sheet of the present invention. In addition, the present cleaning sheets can provide a perfume odor to a surface being  
30       wiped with the cleaning sheets, without leaving an unacceptable residue on the surface. As such, the present invention further relates to a method of imparting perfume odor to a surface comprising contacting the surface with a cleaning sheet of the present invention. The perfume odor imparted to the treated surface is relatively long-lasting, due to the unique mixture of perfume and additive material affixed to the substrate.

The present invention further relates to cleaning implements comprising the present cleaning sheets; processes for manufacturing cleaning sheets; and articles of manufacture comprising a cleaning sheet of the present invention packaged in a container.

#### BRIEF DESCRIPTION OF THE DRAWINGS

5           FIG. 1 is a graph of "Perfume Fraction Remaining" versus "Time (hours)" for Test Samples #1-4 as described in Example II hereinafter.

#### DETAILED DESCRIPTION OF THE INVENTION

##### I. CLEANING SHEETS

10           The cleaning sheets of the present invention comprise a substrate, perfume, and an additive material, wherein the perfume and additive material are affixed to said substrate. The additive material has a melting point of at least about -15°C, preferably at least about 20°C, and more preferably at least about 35°C. The perfume and additive material are preferably first blended together and then affixed to the substrate such that the blend of perfume and additive material has a melting point of at least about 20°C, preferably at least about 25°C, and more  
15           preferably at least about 30°C.

          As used herein, the phrase "melting point" refers to the temperature at which a solid changes to a liquid. Where available, we have chosen to use the standard melting temperature(s) as quoted in published literature. For those components and/or blends where no "melting point" is available, the phrase "melting point" refers, for a pure compound, an impure mixture or a  
20           solution, to the temperature at which the maximum endothermic heat flow is observed for a melting state change by differential scanning calorimetry ("DSC") using a Perkin-Elmer model DSC 7 differential scanning calorimeter to scan at a range of from -20°C to 80°C at a rate of 5°C/min. Where discrepancy exists between published "melting points", the experimentally defined "melting point" applies.

##### 25           A. SUBSTRATES

          The present invention encompasses cleaning sheets comprising a substrate, an additive material, and a perfume that is selected to provide a long-lasting perfume odor, both for the cleaning sheet itself and also on the surfaces cleaned with the cleaning sheet, while maintaining the ability of the cleaning sheet to pick up and retain particulate material from surfaces, while  
30           minimizing the amount of residue left on the surface being cleaned. If the type of additive material and perfume on the substrate of the cleaning sheet are not carefully selected, the sheet will not exhibit long-lasting perfume odor and will tend to leave a residue on the surface being cleaned, resulting in filming and streaking of the surface that is unacceptable to consumers.

The substrates of the cleaning sheets of the present invention typically have a total aggregate basis weight of at least about 20 g/m<sup>2</sup>, preferably at least about 40 g/m<sup>2</sup>, and more preferably at least about 60 g/m<sup>2</sup>. The total aggregate basis weight of the substrates of the present cleaning sheets is typically no greater than about 275 g/m<sup>2</sup>, preferably no greater than about 200 g/m<sup>2</sup>, and more preferably no greater than about 150 g/m<sup>2</sup>.

The substrates of the present cleaning sheets can be made using either a woven or nonwoven process, or by forming operations using melted materials laid down on forms, especially in belts, and/or by forming operations involving mechanical actions/modifications carried out on films. The structures are made by any number of methods (e.g., spunbonded, meltblown, hydroentangled, resin bonded, heat-bonded, air-through bonded, etc.), once the desired characteristics are known. However, the preferred structures are nonwoven, and especially those formed by hydroentanglement and/or heat-bonding as is well known in the art, since they can provide highly desirable open structures. Therefore, preferred cleaning sheets are nonwoven structures having the characteristics described herein. Materials particularly suitable for forming the preferred nonwoven cleaning sheet of the present invention include, for example, natural fibers, e.g. wood pulp, cotton, wool, and the like, as well as biodegradable fibers, such as polylactic acid fibers, and synthetic fibers such as polyolefins (e.g., polyethylene and polypropylene), polyesters, polyamides, synthetic cellulose (e.g., RAYON®, Lyocell), cellulose acetate, bicomponent fibers, and blends thereof. Also useful are natural fibers, such as cotton or blends thereof and those derived from various cellulosic sources, however these are not preferred. Preferred starting materials for making the cleaning sheets of the present invention are synthetic materials, which may be in the form of carded, spunbonded, meltblown, airlaid, or other structures. Cleaning sheets comprising synthetic materials or fibers typically have desirable electrostatic properties, which is preferred. Particularly preferred are polyesters, especially carded polyester fibers. The degree of hydrophobicity or hydrophilicity of the fibers is optimized depending upon the desired goal of the sheet, either in terms of type of soil to be removed, the type of perfume and additive material that is provided, biodegradability, availability, and combinations of such considerations. In general, the more biodegradable materials tend to be hydrophilic, but the more effective materials tend to be hydrophobic.

Although substrates comprising synthetic fibers (including mixtures, up to 100%, of synthetic and natural fibers) are preferred, affixing perfume to such substrates can be more difficult than affixing perfume to substrates consisting of only natural fibers, as natural fibers tend to adsorb perfume more effectively than synthetic fibers. As a result, if the substrate of the

present cleaning sheet is comprised of at least some synthetic fibers, it is especially important and can be beneficial to have the additive material to help affix the perfume to the substrate.

The substrates of the present cleaning sheets may be formed from a single fibrous layer, but preferably are a composite of at least two separate layers. As noted above, preferred substrates  
5 in the cleaning sheets in the present invention include a variety of structures, such as hydroentangled substrates and/or heat-bonded substrates.

The present cleaning sheets comprise a substrate having affixed thereto a perfume and an additive material. The type and level of perfume and additive material is selected such that the cleaning sheet exhibits a long-lasting perfume odor and has the ability to effectively pick-up and  
10 retain particulate material, while maintaining the electrostatic properties of the cleaning sheet and minimizing the residue left on a surface being wiped with the cleaning sheet.

Substrates for cleaning sheets useful in the present invention include, but are not limited to, those described in co-pending U.S. Application Serial No. 09/082,349 filed May 20, 1998 by Fereshtekhou et al. (published as WO 98/52459); co-pending U.S. Application Serial No.  
15 09/082,396 filed May 20, 1998 by Fereshtekhou et al. (published as WO 98/52458); co-pending U.S. Application Serial No. 09/729,626 filed Nov. 30, 2000 by Wong et al.; U.S. Patent No. 6,143,393 issued Nov. 7, 2000 to Abe et al.; U.S. Patent No. 5,525,397 issued June 11, 1996 to Shizuno et al.; EP 774,229 A2 published May 21, 1997; EP 777,997 A2 published June 11, 1997; JP 09-224,895 published September 2, 1997; and JP 09-313,416 published December 9, 1997;  
20 which are all incorporated herein by reference.

#### Preferred Hydroentangled Substrates

Hydroentangled substrates are particularly useful in the present invention due to their ability to effectively pick-up and retain particulate material from surfaces. Hydroentangled substrates can be woven or nonwoven, however, the preferred hydroentangled substrates of the  
25 present invention are nonwoven.

The present invention encompasses a wide variety of structures of hydroentangled substrates. The substrates can have relatively uniform basis weight across the entire area of the sheet, or the substrates can have discrete regions of differing basis weight. In addition, the substrates can have relatively flat surfaces, or the cleaning sheets can exhibit macroscopic three-  
30 dimensionality.

To enhance the integrity of the present hydroentangled cleaning sheets, it can be preferred, but not essential, to include a polymeric net (referred to herein as a "scrim" material) that is arranged with the fibrous material, e.g., through lamination via heat or chemical means such as adhesives, via hydroentanglement. Scrim materials useful herein are described in detail in

U.S. Patent No. 4,636,419, which is incorporated herein by reference. The scrims may be formed directly at the extrusion die or can be derived from extruded films by fibrillation or by embossment, followed by stretching and splitting. The scrim may be derived from a polyolefin such as polyethylene or polypropylene, copolymers thereof, poly(butylene terephthalate), polyethylene terephthalate, Nylon 6, Nylon 66, and the like. Scrim materials are available from various commercial sources. A preferred scrim material useful in the present invention is a polypropylene scrim, available from Conwed Plastics (Minneapolis, MN).

Hydroentangled substrates suitable for the cleaning sheets of the present invention include those described in co-pending U.S. Application Serial No. 09/082,349 filed May 20, 1998 by Fereshtekhou et al. (published as WO 98/52459); co-pending U.S. Application Serial No. 09/082,396 filed May 20, 1998 by Fereshtekhou et al. (published as WO 98/52458); co-pending U.S. Application Serial No. 09/729,626 filed Nov. 30, 2000 by Wong et al.; and U.S. Patent No. 5,525,397 issued June 11, 1996 to Shizuno et al.

#### Preferred Heat-Bonded Substrates

A preferred heat-bonded substrate of the present cleaning sheets comprises a base sheet and at least one layer comprising filaments or split yarns oriented in one direction, said base sheet and said layer being stacked and bonded together at a plurality of bonding lines extending in a direction intersecting with said one direction, said base sheet being cut together with said layer at a plurality of cutting portions aligned intermittently in said intersecting direction, thereby forming a plurality of brushing portions with said filaments or split yarns positioned between the bonding lines and the cutting portions in said one direction.

The base sheet can be comprised of any number of materials so long as the material has sufficient strength for use in a cleaning sheet, including nonwoven fabrics such as spunbonded webs, resin films, a synthetic fiber containing cloth, or the like.

The layer comprising filaments or split yarns can be formed of a great number of filaments or split yarns by orienting them in one direction and bundling them. The layer may be formed only with the filaments or the split yarns or may be formed with both of the filaments and the split yarns.

The filaments can be formed into a material generally called as a tow, for example. The tow is a bundle comprising a number of oriented filaments. The filaments are prepared, for example, from polyethylene, polypropylene, nylon, polyester and rayon. Among them, composite fibers comprising polyester as a core component and polyethylene as a sheath component are preferably used.



The split yarns are prepared from a sheet shaped material such as a non-woven fabric or a film by cutting them into a rectangular shape with an extremely small width. Thus obtained rectangular materials i.e., split yarns are further bundled. Well-known non-woven fabric or film can be used. The rectangular material is preferably of a shape having such appropriate thickness and width as capable of catching dusts. The longitudinal size of the filament or the split yarn may  
5 be properly controlled as long as the size is greater than the distance between bonding lines that are adjacent with each other. Further, the filaments may be crimped as required.

The base sheet and the layer comprising filaments or split yarns preferably contain a thermoplastic resin. In this case, the layer and the base sheet are bonded by welding such as heat  
10 welding using hot emboss roll or ultrasonic welding. In this method, the thermoplastic resin contained in the base sheet and the layer comprising filaments or split yarns are welded together to form the bonding lines.

A process for manufacturing a preferred heat-bonded substrate for the present cleaning sheets comprises the steps of: (a) feeding a base sheet and at least one layer continuously and  
15 stacking said layer to said base sheet, wherein said layer comprises filaments or split yarns oriented in one direction; (b) bonding said base sheet and said layer at a plurality of bonding lines in a direction intersecting with said one direction to obtain a sheet material; (c) cutting said sheet material at a plurality of cutting portions aligned intermittently in said intersecting direction, thereby forming a plurality of brushing portions with said filaments or split yarns positioned  
20 between the bonding lines and the cutting portions; and (d) separating said sheet material to obtain a cleaning product.

A preferred heat-bonded substrate for the present cleaning sheets is described in further detail in U.S. Patent No. 6,143,393 issued Nov. 7, 2000 to Abe et al., which is incorporated herein by reference. Other heat-bonded substrates suitable for the present cleaning sheets include those  
25 described in co-pending U.S. Application Serial No. 09/630,713, filed Aug. 2, 2000 by Kacher et al. (published as WO 01/11004), which is incorporated herein by reference.

#### B. PERFUME

The cleaning sheets of the present invention further comprise a perfume affixed to the substrates of the cleaning sheets. Perfume is aesthetically important in cleaning sheets as it  
30 provides a positive scent signal to a consumer using the cleaning sheet, which reinforces the cleaning performance of the cleaning sheet. Cleaning sheets comprising perfume tend to be favored by many consumers because they can make cleaning chores more pleasant by providing the consumer a pleasing aroma, as compared to cleaning sheets that are free of perfume.

Perfume is typically affixed to the substrates of the present cleaning sheets at a level of from about 0.015 g/m<sup>2</sup> to about 5 g/m<sup>2</sup>, preferably from about 0.05 g/m<sup>2</sup> to about 2 g/m<sup>2</sup>, and more preferably from about 0.07 g/m<sup>2</sup> to about 0.8 g/m<sup>2</sup>, by weight of the cleaning sheet. The perfume is preferably uniformly distributed on the substrate. However, in some embodiments, it can be preferred to distribute the perfume and/or additive material non-uniformly on the substrate. It can be preferred to have "targeted" or "zoned" application of the perfume and/or additive material, especially when high levels of perfume and/or additive material are desired in concentrated areas that do not contact the surface being cleaned, such that residue problems are avoided. The perfume can be distributed on both sides of the substrate or on just one side of the substrate, preferably on at least one side of the substrate in contact with a surface being cleaned with the substrate.

It can be important to select certain perfume materials to create perfumes that connote "fresh and clean" odor characters. Such preferred odor characters include, but are not limited to, citrus odor character (i.e. lemon, orange, lime, and the like), outdoor odor character (i.e. green, woody, fruity, and the like), floral odor character (i.e. jasmine, lavender, orange flower, and the like), or the like.

Perfumes that have "fresh and clean" odor characters tend to comprise highly volatile perfume materials. As a result, the perfume tends to quickly volatilize off the substrate and the cleaning sheet quickly loses its perfume odor. It is thus important to include an additive material having a melting point of at least about -15°C, as described hereinafter, to minimize such perfumes from volatilizing off the substrates of the cleaning sheets.

In preferred embodiments, the perfume comprises certain levels and types of perfume materials which are characterized by their boiling point (B.P.). The boiling points of the perfume materials (ingredients) herein are determined at the normal, standard pressure of about 760 mmHg.

Boiling points of many perfume ingredients can be found in the following sources:

Properties of Organic Compounds Database CD-ROM Ver. 5.0  
CRC Press  
Boca Raton, Florida

Flavor and Fragrance - 1995  
Aldrich Chemical Co.  
Milwaukee, Wisconsin

STN database/on-line  
Design Institute of for Physical Property Data  
American Institute of Chemical Engineers

STN database/on-line  
Beilstein Handbook of Organic Chemistry  
Beilstein Information Systems

5

Perfume and Flavor Chemicals  
Steffen Arctander  
Vol. I, II - 1969

10

When unreported, the 760 mmHg boiling points of perfume ingredients can be estimated.  
The following computer programs are useful for estimating these boiling points:

15

MPBPVP Version 1.25 © 1994-96 Meylan  
Syracuse Research Corporation (SRC)  
Syracuse, New York

ZPARC  
ChemLogic, Inc.  
Cambridge, Massachusetts

20

Non-limiting examples of volatile perfume materials having a boiling point of less than 250°C include those in the following table:

Perfume Material	Boiling Pt. (°C) (Meas.)	Boiling Pt. (°C) (Pred.)
Allyl caproate	186	
Amyl acetate (n-Pentyl acetate)	147	
Amyl Propionate	169	
p-Anisaldehyde	249	
Anisole	154	
Benzaldehyde (Benzenecarboxaldehyde)	179	
Benzyl acetate	211	
Benzylacetone	234	
Benzyl alcohol	205	
Benzyl formate	203	
Benzyl isovalerate		256
Benzyl propionate	221	
beta-gamma-Hexenol (2-Hexen-1-ol)		164
(+)-Camphor	207	
(+)-Carvone	231	
L-Carvone		230
Cinnamic alcohol		258
Cinnamyl formate	252	
cis-Jasmone		253
cis-3-Hexenyl acetate		175

Citral (Neral)	208	
Cumic alcohol	249	
Cuminaldehyde	235	
Cyclal (2,4-Dimethyl-3-cyclohexene-1-carboxaldehyde)		203
Dimethyl benzyl carbinol	215	
Dimethyl benzyl carbonyl acetate		248
Ethyl acetate	77	
Ethyl acetoacetate	181	
Ethyl amyl ketone	167	
Ethyl benzoate	215	
Ethyl butanoate	121	
3-Nonanone (Ethyl hexyl ketone)	187	
Ethyl phenylacetate	228	
Eucalyptol	176	
Eugenol	253	
Fenchyl alcohol	199	
Flor Acetate (Tricyclodecenyl acetate)		233
Frutene (Tricyclodecenyl propionate)		250
gamma-Nonalactone	243	
trans-Geraniol	230	
cis-3-Hexen-1-ol / Leaf Alcohol	156	
Hexyl acetate	171	
Hexyl formate	155	
Hydratopic alcohol		233
Hydroxycitronellal	241	
Indole (2,3-Benzopyrrole)	254	
Isoamyl alcohol	131	
Isopropyl phenylacetate		237
Isopulegol		231
Isoquinoline (Benzopyridine)	243	
Ligustral (2,4-Dimethyl-3-Cyclohexene-1-carboxaldehyde)		204
Linalool	193	
Linalool oxide		223
Linalyl formate		212
Menthone		214
4-Methylacetophenone	226	
Methyl pentyl ketone	151	
Methyl anthranilate	256	
Methyl benzoate	199	
Methyl Phenyl Carbonyl Acetate (alpha-Methylbenzyl acetate)		216
Methyl Eugenol (Eugenyl methyl ether)	254	
Methyl Heptenone (6-Methyl-5-hepten-2-one)	173	
Methyl Heptene Carbonate (Methyl 2-octynoate)	218	

Methyl Heptyl ketone	195	
Methyl Hexyl ketone	173	
Methyl salicylate	223	
Dimethyl anthranilate	255	
Neral		217
Nerol	225	
delta-Nonalactone		226
gamma-Octalactone	256	
2-Octanol	180	
Octyl Aldehyde (Caprylic aldehyde)	167	
p-Cresol	202	
p-Cresyl methyl ether	175	
Acetanisole	258	
2-Phenoxyethanol	245	
Phenylacetaldehyde	195	
2-Phenylethyl acetate	235	
Phenethyl alcohol	218	
Phenyl Ethyl dimethyl Carbinol (Benzyl-tert-butanol)		257
Prenyl acetate		150
Propyl butanoate	143	
(+)-Pulegone	224	
Rose oxide		197
Safrole	235	
4-Terpinenol	211	
Terpinolene (alpha-Terpineol)	219	
Veratrole (1,2-Dimethoxybenzene)	206	
Viridine (Phenylacetaldehyde dimethyl acetal)	220	
Allo-ocimene		195
Allyl cyclohexanepropionate		252
Allyl heptanoate		209
trans-Anethole	232	
Benzyl butyrate	240	
Camphene	160	
Cadinene		252
Carvacrol	238	
cis-3-Hexenyl tiglate		225
Citronellol	223	
Citronellyl acetate	234	
Citronellyl nitrile	226	
Citronellyl propionate		257
Cyclohexylethyl acetate	222	
Decyl Aldehyde (Capraldehyde)	208	
Dihydromyrcenol	192	
Dihydromyrcenyl acetate		221
3,7-Dimethyl-1-octanol	205	
Diphenyloxide	259	

Fenchyl Acetate (1,3,3-Trimethyl-2-norbornanyl acetate)		234
Geranyl acetate	233	
Geranyl formate		231
Geranyl nitrile	228	
cis-3-Hexenyl isobutyrate		204
Hexyl Neopentanoate		213
Hexyl tiglate		221
alpha-Ionone	237	
Isobornyl acetate	238	
Isobutyl benzoate	242	
Isononyl acetate		220
Isononyl alcohol (3,5,5-Trimethyl-1-hexanol)	194	
Isopulegyl acetate		243
Lauraldehyde	250	
d-Limonene	177	
Linalyl acetate		230
(-)-L-Menthyl acetate	227	
Methyl Chavicol (Estragole)	216	
Methyl n-nonyl acetaldehyde	247	
Methyl octyl acetaldehyde		224
beta—Myrcene		165
Neryl acetate	236	
Nonyl acetate	229	
Nonaldehyde	191	
p-Cymene	173	
alpha-Pinene	156	
beta—Pinene	166	
Sabinene		157
alpha-Terpinene	175	
gamma-Terpinene	183	
alpha-Terpinyol acetate	220	
Tetrahydrolinalool	202	
Tetrahydromyrcenol	195	
2-Undecenal		235
Verdox (o-t-Butylcyclohexyl acetate)		239
Vertenex (4-tert-Butylcyclohexyl acetate)		237

Perfume can be comprised of volatile perfume raw materials (i.e. materials having a boiling point of less than 250°C) and residual perfume raw materials (i.e. materials having a boiling point of greater than 250°C), or a mixture of both. The perfume herein is preferably blended with the additive material herein and the blend is affixed to the substrate herein. Developing perfumes for cleaning sheets can differ based on the desired consumer experience. A perfume comprised of mostly volatile perfume raw materials, for example, will allow for a very

effective room odor after use (i.e. providing a perfume "bloom"). Perfumes developed with mostly residual perfume raw materials will allow for longer lasting odor on the cleaning sheet (i.e. product odor) after the package containing the cleaning sheets is opened. If the perfume embodies a mixture of volatile and residual perfume raw materials, the perfume can deliver room odor along with providing a longer lasting odor on the cleaning sheet.

In preferred embodiments, the perfume herein comprises at least about 0.01%, preferably at least about 50%, and more preferably about 100%, by weight of the perfume, of volatile perfume materials having a boiling point of less than 250°C. Preferred perfumes herein comprise at least one or more volatile perfume materials selected from the group consisting of d-limonene, neral, nerol, myrcene, geraniol, alpha-pinene, beta-pinene, gamma-terpinene, linalool, sabinene, and mixtures thereof.

The perfumes herein can also comprise perfume materials that are less volatile, i.e. residual perfume materials having a boiling point of greater than 250°C. Such residual perfume materials tend to be longer-lasting, even without the addition of additive material as described hereinafter. However, the additive material can still enhance perfume longevity of cleaning sheets comprising perfume that contains even relatively large amounts of residual perfume materials.

The perfume works in conjunction with the additive material to provide a long-lasting perfume odor to both the cleaning sheet itself and to the surface being cleaned with the cleaning sheets herein.

In general, the preferred perfumes herein will comprise rather limited amounts of residual perfume materials, for example, less than about 95%, preferably less than about 25%, and more preferably less than about 0.01%, by weight of the perfume. While cleaning sheets with highly volatile perfumes can impart perfume odor to the surface being cleaned with the sheets, if it is desired to impart a more significant perfume odor to the surface, it can be beneficial to have a perfume comprising greater amounts of residual perfume materials; for example, at least about 50%, preferably at least about 75%, and more preferably about 100%, by weight of the perfume.

Non-limiting examples of residual perfume materials having a boiling point of more than 250°C include those in the following table:

Perfume Material	Boiling Pt. (°C) (Meas.)	Boiling Pt. (°C) (Pred.)
Coumarin	302	
Ethyl methylphenylglycidate	274	

Ethyl Vanillin	285	
Isoeugenol	266	
Methyl cinnamate	262	
Methyl dihydrojasmonate		314
Methyl beta-naphthyl ketone	302	
Phenoxy ethyl isobutyrate		277
Vanillin	285	
(Ambrettolide)		
Oxacycloheptadec-10-en-2-one		352
(Amyl benzoate) n-Pentyl benzoate		263
Isoamyl cinnamate		300
alpha-Amylcinnamaldehyde	289	
alpha-Amylcinnamaldehyde dimethyl acetal		320
(iso-Amyl Salicylate) isopentyl salicylate	277	
(Aurantol) Methyl anthranilate/hydroxycitronellal Schiff base		413
Benzophenone	305	
Benzyl salicylate	320	
beta-Caryophyllene		263
Cedrol		274
Cedryl acetate		289
Cinnamyl cinnamate		387
Citronellyl isobutyrate		266
Cyclohexyl salicylate		327
Cyclamen aldehyde		271
delta-Dodecalactone		279
(Dihydro Isojasmonate) Methyl 2-hexyl-3-oxo- cyclopentanecarboxylate		314
Diphenylmethane	265	
Ethylene brassylate		390
Ethyl undecylenate	261	
Iso E Super		307
(Exaltolide) Pentadecanolide		338
(Galaxolide) 4,6,6,7,8,8-Hexamethyl- 1,3,4,6,7,8-hexahydro-cyclopenta(G)-2- benzopyran		335
gamma-Methyl Ionone (alpha-Isomethylionone)		278
Geranyl isobutyrate		295
Hexadecanolide		352
cis-3-Hexenyl salicylate		323
alpha-Hexylcinnamaldehyde		334
n-Hexyl salicylate		318
alpha-Irone		279
6-Isobutylquinoline		294
Lilial (p-tert. Butyl-alpha- methyl dihydrocinnamic aldehyde, PT Bucinol)		



		282
Linalyl benzoate		325
(2-Methoxy Naphthalene) beta-Naphthyl methyl ether	274	
10-Oxahexadecanolide		355
Patchouli alcohol		317
(Phantolide) 5-Acetyl-1,1,2,3,3,6-hexamethylindan		333
Phenethyl benzoate		335
Phenethyl phenylacetate		350
Phenyl Hexanol (3-Methyl-5-phenyl-1-pentanol)		296
Tonalid (7-Acetyl-1,1,3,4,4,6-hexamethyltetralin)		344
delta-Undecalactone		262
gamma-Undecalactone	286	
Vertinert Acetate		332

As noted hereinbefore, the perfume is preferably affixed to the substrate along with an additive material having a melting point of at least about -15°C, to provide a cleaning sheet having a long-lasting perfume odor. The resulting cleaning sheet is also able to provide a long-lasting perfume odor to the surface being cleaned. The perfume and additive material can be affixed separately to the substrate or can be first blended together and then the blend can be affixed to the substrate.

#### C. ADDITIVE MATERIAL

The longevity of the perfume odor of the cleaning sheets of the present invention is enhanced by affixing an additive material having a melting point of at least about -15°C to the substrate of the present cleaning sheets. The additive materials herein tend to control or regulate the more volatile perfume raw materials from volatilizing off of the cleaning sheets. If perfume alone is affixed to the substrates of the cleaning sheets, the perfume tends to quickly volatilize off of the cleaning sheet. As a result, the cleaning sheet quickly loses its perfume odor.

Another benefit of the unique combination of perfume and additive material as described herein is that the present cleaning sheets are capable of providing a long-lasting perfume odor to the surface being cleaned. In this respect, a small amount of the blend of perfume and additive material is transferred to the surface being cleaned. The additive material then provides a slow release of the perfume over time. Furthermore, the blend of perfume and additive material herein typically does not result in filming or streaking of the surface being cleaned.

The benefits resulting from the use of the additive material described herein are typically achieved when a blend of perfume and additive material is provided in a solid, semi-solid, or

solid-like continuous mixture. Most perfumes are volatile liquids at room temperature. By addition of the additive material, the perfume is thus contained in a solid, semi-solid, or solid-like continuous blend. The additive material can be selected to achieve a certain melting profile, for example, to be a liquid at a low enough processing temperature to be safe with respect to processing conditions (due to flashpoint of perfume) while also giving a solid, semi-solid, or solid-like continuous mixture at room temperature. The additive material can also be selected to achieve a certain blend "hardness". The hardness of the blend of perfume and additive material can be adjusted by variation of the components of the additive material to give a desirable perfume diffusion rate. Slower perfume diffusion is typically observed in more solid-like blends as compared to liquids. The diffusion of perfume is dramatically affected by the hardness of a blend. Also, the hardness could be varied to give a desirable in-use character- such as feel, and /or residue deposition. This is reflected in Example II hereinafter.

By selection of suitable component, components, and/or mix ratios of the additive material, the melting and freezing profile can be varied, and, variation in the diffusivity can be varied with the of the degree of "hardness" of the blend. One example is an additive consisting of paraffin wax and mineral oil. The "hardness" of the blend can be varied from can be solid, semi-solid, or solid-like continuous blend. This particular blend offers good flexibility in regulating diffusivity of perfume, while at the same time gives advantageous thermal character.

The additive material also can enhance the ability of the cleaning sheet to pick-up and retain particulate matter, such as dust or the like, from the surfaces contacted or wiped with the cleaning sheet.

The additive material is preferably affixed to the cleaning sheet at an add-on level of at least about  $0.04 \text{ g/m}^2$ , more preferably at least about  $1 \text{ g/m}^2$ , and more preferably at least about  $2.5 \text{ g/m}^2$ , by weight of the cleaning sheet. Typically, the add-on level of the additive material is from about  $0.04 \text{ g/m}^2$  to about  $35 \text{ g/m}^2$ , more preferably from about  $1 \text{ g/m}^2$  to about  $5 \text{ g/m}^2$ , more preferably from about  $2 \text{ g/m}^2$  to about  $3 \text{ g/m}^2$ , by weight of the cleaning sheet. The level and type of additive material is selected to minimize perfume loss and to minimize the residue that is left of the surface wiped with the present cleaning sheets to leave the surface visually acceptable to consumers. The level and type of additive material is also selected to increase the cleaning performance of the cleaning sheet.

The additive materials suitable for cleaning sheets of the present invention have a melting point of at least about  $-15^\circ\text{C}$ , preferably at least about  $20^\circ\text{C}$ , and more preferably at least about  $35^\circ\text{C}$ . The melting point of the additive material is important such that when the additive material is affixed to the substrate along with the perfume, the additive material is able to effectively

reduce the loss of perfume odor from the present cleaning sheets. Additive materials having too low of a melting point tend not to be able to effectively reduce the loss of perfume odor from the present cleaning sheets.

- 5 A wide variety of additive materials, including mixtures of different components, are suitable for use in the present cleaning sheets, so long as the melting point of the additive material is at least about -15°C. The following table provides non-limiting examples of suitable additive materials for the present cleaning sheets:

<u>Additive Material</u>	<u>Melting Point (°C)</u>
Paraffin Wax <sup>a</sup>	53 to 57
Microcrystalline Wax <sup>b</sup>	88 to 93
Carnauba Wax <sup>c</sup>	At least 83
White Ozkerite Wax <sup>d</sup>	72 to 76
Cetyl Alcohol <sup>e</sup>	47 to 50
Stearyl Alcohol <sup>f</sup>	56 to 60
Sorbitan Stearate <sup>g</sup>	56 to 58
Glycerine <sup>h</sup>	20

- 10 <sup>a</sup> Commercially available from Strahl & Pitsch under the trade name S&P No. 2278.  
<sup>b</sup> Commercially available from Strahl & Pitsch under the trade name S&P No. 617.  
<sup>c</sup> Commercially available from Strahl & Pitsch under the trade name S&P No. 63.  
<sup>d</sup> Commercially available from Strahl & Pitsch under the trade name S&P No. 1028.  
<sup>e</sup> Commercially available from The Procter & Gamble Co. under the trade name CO-1695.  
15 <sup>f</sup> Commercially available from The Procter & Gamble Co. under the trade name CO-1895.  
<sup>g</sup> Commercially available from ICI under the trade name Span 60.  
<sup>h</sup> Commercially available from The Procter & Gamble Co. under the trade name Star.

- 20 Preferably, the additive material has a melting point that is less than about 150°C, more preferably less than about 90°C, and even more preferably less than about 70°C.

- It should be noted that the additive material can comprise a number of different components, so long as the additive material mixture has a melting point of at least about -15°C. For example, the additive material can comprise a first component having a melting point of at least about -15°C (e.g. paraffin wax, which has a melting point of about 50°C) and a second  
25 component having a melting point of less than about -15°C (e.g. mineral oil, which has a melting

point of  $-18^{\circ}\text{C}$ ), so long as the combination of the first and second components results in an additive material having a melting point of at least about  $-15^{\circ}\text{C}$ . In this example, the levels of the first and second components are adjusted such that the additive material has the requisite melting point.

5           A preferred additive material comprises a wax or a mixture of an oil (e.g., mineral oil, etc.) and a wax. Suitable waxes include various types of hydrocarbons, as well as esters of certain fatty acids (e.g., saturated triglycerides) and fatty alcohols. They can be derived from natural sources (i.e., animal, vegetable or mineral) or can be synthesized. Mixtures of these various waxes can also be used. Some representative animal and vegetable waxes that can be used in the present  
10 invention include beeswax, carnauba, spermaceti, lanolin, shellac wax, candelilla, and the like. Representative waxes from mineral sources that can be used in the present invention include petroleum-based waxes such as paraffin, petrolatum and microcrystalline wax, and fossil or earth waxes such as white ceresine wax, yellow ceresine wax, white ozokerite wax, and the like. Representative synthetic waxes that can be used in the present invention include ethylenic  
15 polymers such as polyethylene wax, chlorinated naphthalenes such as "Halowax," hydrocarbon type waxes made by Fischer-Tropsch synthesis, and the like. Other preferred additives are supplied as mixtures of wax and oil, such as petrolatum. Such additives can be used by themselves or in combination with other wax and oils.

          A preferred additive material is a mixture of a wax and mineral oil, as it enhances the  
20 ability of the cleaning sheet to pick up and retain particulate material from surfaces, while minimizing the amount of residue left on the surface being wiped with the cleaning sheet. When a mixture of mineral oil and wax is utilized, the components will preferably be mixed in a ratio of wax to oil of from about 1:99 to about 99:1, more preferably from about 1:99 to about 10:1, still more preferably from about 1:1 to about 7:3, by weight of the additive material. In a particularly  
25 preferred embodiment, the ratio of wax to oil is about 7:3, by weight. The additive material can be applied at an add-on level of from about  $0.04\text{ g/m}^2$  to about  $35\text{ g/m}^2$ , preferably from about  $1.7\text{ g/m}^2$  to about  $15\text{ g/m}^2$ , and more preferably about  $2.7\text{ g/m}^2$ , by weight. A preferred mixture is a 7:3 mixture of paraffin wax and mineral oil.

          Wax alone, such as paraffin wax, can be utilized as an additive material to the present  
30 cleaning sheets. Where the additive material consists of only a wax, the cleaning sheets are preferably comprised of synthetic fibers, so that the cleaning sheet is still able to maintain electrostatic properties to provide enhanced particulate material pick-up and retention. In any event, if the cleaning sheet comprises natural and/or synthetic fibers, an additive material that consists essentially of wax is typically applied to the substrates of the present cleaning sheets at

an add-on level of no greater than about 35 g/m<sup>2</sup>, preferably no greater than about 15 g/m<sup>2</sup>, more preferably no greater than about 5 g/m<sup>2</sup>, and even more preferably no greater than about 3 g/m<sup>2</sup>, by weight of the cleaning sheet. These levels are preferred because if a wax additive is applied to the cleaning sheets at higher levels, the electrostatic properties of the sheet will typically be diminished, and therefore decrease the overall cleaning performance of the sheet. Preferably, the additive material does not significantly diminish the electrostatic properties of the cleaning sheet. It is preferable that the cleaning sheet of the present invention have electrostatic properties in order to facilitate pick-up and retention of particulate material, especially for fine dust particulate material. In this respect, the present cleaning sheet are preferably essentially free of, or free of, cationic surfactants, as cationic surfactants would tend to negate the electrostatic properties of the present cleaning sheets.

These low levels are especially desirable when additive materials are applied at an effective level and preferably in a substantially uniform way to at least one discrete continuous area of the sheet. Use of the preferred lower levels, especially of additive materials that improve adherence of soil to the sheet, provides surprisingly good cleaning, dust suppression in the air, preferred consumer impressions, especially tactile impressions.

The additive material can also comprise materials that can form complexes with perfumes. For example, the perfume can be complexed with cyclodextrin to form a perfume complex and then the complex can be affixed to the substrate or blended with the additive material and affixed to the substrate. Perfume/cyclodextrin complexes are described in more detail in U.S. Pat. Nos.: 5,102,564 and 5,234,610, which is incorporated herein by reference. In a preferred embodiment, however, the cleaning sheet is essentially free of cyclodextrin. Other complexing materials include starch encapsulated accords ("SEAs"), microcapsules, and the like.

In a preferred embodiment, the perfume and additive material are first blended together and then affixed to the substrate, such that the blend of perfume and additive material has a melting point of at least about 20°C, preferably at least about 25°C, and more preferably at least about 35°C. In this respect, the level of perfume and level of additive material are adjusted such that the blend of perfume and additive material has the requisite melting point. For example, the perfume and additive material are preferably present in a ratio of additive material to perfume of from about 1:2 to about 30:1, more preferably from about 1:1 to about 25:1, and even more preferably from about 9:1 to about 19:1, by weight. In a preferred embodiment, the ratio of additive material to perfume is about 9:1.

The types and levels of perfume and additive material are preferably selected such that the cleaning sheet is substantially dry to the touch, for example, the preferred cleaning sheets

herein are not moistened or premoistened cleaning sheets. In this respect, the additive material is preferably substantially non-aqueous, meaning that only slight traces of water are present, if at all.

## II. CLEANING IMPLEMENTS

5 In another aspect, the present invention relates to a cleaning implement comprising the cleaning sheets, discussed herein, removably attached to a handle. In this regard, the cleaning implement comprises a handle; and a removable cleaning sheet comprising a substrate having affixed thereto perfume and additive material having a melting point of at least about -15°C.

10 The handle of the cleaning implement comprises any elongated, durable material that will provide ergonomically practical cleaning. The length of the handle will be dictated by the end-use of the implement. A suitable handle for the present cleaning implements is shown in detail in U.S. Patent No. D409,343, which is incorporated herein by reference.

15 The handle will preferably comprise at one end a support head to which the cleaning sheet can be releasably attached. To facilitate ease of use, the support head can be pivotably attached to the handle using known joint assemblies. Any suitable means for attaching the cleaning sheet to the support head can be utilized, so long as the cleaning sheet remains affixed during the cleaning process. Examples of suitable fastening means include clamps, hooks & loops (e.g., VELCRO®), and the like. In a preferred embodiment, the support head will comprise means for gripping the sheet on its upper surface to keep the sheet mechanically attached to the head during the rigors of cleaning. However, the gripping means will readily release the sheet for convenient removal and disposable. Suitable gripping means are described in more detail in co-pending U.S. Application Serial No. 09/374714 filed August 13, 1999 by Kingry et al. (published as WO 01/12052), which is incorporated herein by reference.

## III. PROCESS OF MANUFACTURE

25 The substrates of the present cleaning sheets are manufactured according to processes described in the art, particularly in the patents incorporated herein by reference. The perfume and additive material can be affixed to the substrate either during the manufacture of the substrate or after manufacture of the substrate. Preferably, the perfume and additive material are affixed to the substrate in a line operation, wherein the substrate is first formed and then the perfume and additive material are affixed to the substrate immediately after formation of the substrate.

30 The perfume and additive material can be applied to the substrates of the present cleaning sheets via a variety of application methods. Such methods include manual rolling, mechanical rolling, slotting, ultrasonic spraying, pressurized spraying, pump spraying, dipping, and the like. A preferred method of application of the perfume and additive material to the substrate is by ultrasonic spraying. In order to spray the perfume and additive material onto the substrate, the

additive material is preferably heated to a temperature at which the additive material becomes liquid and then the perfume is blended with the additive material. The blend of perfume and additive material is then uniformly sprayed onto the substrate of the cleaning sheet.

Another preferred embodiment of the process is using ultrasonic spraying to separately  
5 apply the perfume and the additive material to the substrate. In this process, the perfume can firstly be sprayed onto the substrate and then the additive material can be heated to a temperature at which it becomes liquid and sprayed onto the substrate containing the perfume. In this process, the additive material can form a coating layer over the perfume.

Another preferred method of application of the perfume and additive material to the  
10 substrate of the cleaning sheet is by mechanical rolling. During the process of making the substrates, the substrates are fed through a set of rollers that are coated with the blend of perfume and additive material to be applied. The rollers can be coated with the additive by rotating in a pan or reservoir containing the perfume and additive material. As the substrates are fed through the rollers, the perfume and additive material are transferred from the rollers to the substrates of the  
15 cleaning sheets. In such a process, the additive material is heated in the pan or reservoir to a temperature at which the additive material becomes liquid and then the perfume is blended with the additive material. The blend of perfume and additive material is then maintained at a temperature high enough to maintain the blend of perfume and additive material in liquid form. In a preferred embodiment, wherein the additive material comprises a mixture of a wax and mineral  
20 oil, particularly in a ratio of wax to mineral oil of 7:3, a mix tank containing the additive material is preferably heated to a temperature of from about 32°C to about 90°C, preferably from about 35°C to about 70°C, in order to maintain the additive material in a fluid state. The perfume is then blended with the additive material in the mix tank and conveyed to the application pan and rollers. In such a situation, the pan and rollers are also preferably heated to a temperature similar to the  
25 temperature of the hot blend of perfume and additive material in a fluid state. As with a spraying process, the perfume and additive material can be applied to the substrate separately.

For small scale production of the present cleaning sheets, the additive can also be applied to the cleaning sheet via manual rolling, which comprises taking a hand-held roller, coating the roller with additive, and rolling the roller across the surface of the cleaning sheet.

#### 30 IV. METHODS OF USE

The cleaning sheets and, separately, the cleaning implements of the present invention are designed to be compatible with all hard surface substrates, including wood, vinyl, linoleum, no wax floors, ceramic, FORMICA®, porcelain, and the like. They have also been found to be

effective on surfaces like walls, ceilings, upholstery, drapes, rugs, clothing, etc., where dusting sheets have not normally been used.

As a result of the ability of the cleaning sheets to reduce, or eliminate, by various means, including contacting and holding, dust, lint and other airborne matter from surfaces, as well as  
5 from the air, the sheets will provide greater reduction in the levels of such materials on surfaces and in the atmosphere, relative to other products and practices for similar cleaning purposes. This ability is especially apparent in sheets containing additive materials as described herein. Therefore it is important to provide this information on the package, or in association with the package, so as to encourage the use of the sheets, especially on the non-traditionally dusted surfaces like  
10 walls, ceilings, upholstery, drapes, rugs, clothing, etc.

The methods of the present invention generally comprise the step of contacting, preferably wiping, a surface with a cleaning sheet described herein. A preferred embodiment encompasses a method of removing dust (or the like) from a surface comprising the step of contacting, preferably wiping, the surface with a cleaning sheet described herein.

As discussed hereinbefore, the cleaning sheets of the present invention can be particularly  
15 effective in imparting a perfume odor to the surface being cleaned with the cleaning sheet, in addition to removing dust or the like from the surface. As a result, another preferred embodiment of the present methods relates to a method of imparting a perfume odor to a surface and, optionally, removing dust (or the like) from the surface comprising the step of contacting,  
20 preferably wiping, the surface with a cleaning sheet described herein.

#### V. ARTICLES OF MANUFACTURE

In another aspect, the present invention relates to an article of manufacture comprising the cleaning sheets described herein packaged in a container. The container can be any one of a variety of containers, including, for example, paperboard cartons, flow wrap, odor barrier  
25 overwrap, laminated cartons, and the like.

A preferred package for the present cleaning sheets is a paperboard carton having an inner surface that is laminated or sprayed with a film to serve as a barrier and to minimize the amount of perfume volatilizing from the cleaning sheets and escaping through the carton. A preferred film is an oriented polypropylene film. Suitable oriented polypropylene films are commercially  
30 available from ExxonMobil Chemical under the trade names BICOR<sup>®</sup> AOH and BICOR<sup>®</sup> AXT. The oriented polypropylene film is preferably laminated to the inner surface of the paperboard carton.

#### EXAMPLE I



This Example illustrates the manufacture of a preferred cleaning sheet of the present invention. Two carded polyester fiber webs, having a denier of 1.5 denier, are prepared. The combination of the two carded webs and a scrim material are placed on top of a forming belt. The webs are then hydroentangled with the scrim material to form a substrate and dried. The water entangling process causes the fibers to become entangled with each other and with the scrim material, while causing the fibers to move apart and provide two distinct basis weight regions. The substrate is then dried, and slit into the appropriate widths to be coated, folded and packaged. The perfume additive is produced by first receiving a pre-blended ratio of paraffin wax and mineral oil. The blend is received in a molten state via tank truck. The wax/oil blend is off loaded into an electrically heated mix tank and held at 60°C. The mix is recirculated and agitated using an air top mount style agitator. The agitator is activated with the agitator blade turning at about 40rpm and the perfume is then added. The additive and perfume is mixed until homogenous. The combined mix of perfume, wax, oil is then pumped to a series of pans or reservoirs. The pans are mounted under the applicator rolls. The applicator rolls are a type of gravure roll containing individual cells. The applicator rolls are immersed in the fluid in the pans, rotating in the molten liquid, picking up the mix with the cells and depositing the mix on the substrate. As the substrate is pulled over the applicator rolls the mix is deposited on the substrate at the desired coating weight. Applicator roll speed, applicator roll cell size/dimension, and mix viscosity are the key levers to regulate the amount of mix deposited on the web.

20

#### EXAMPLE II

This Example provides an experimental procedure that simulates the effectiveness of an additive material having a melting point of at least about -15 °C in preventing the loss of perfume odor of a cleaning sheet over time. The results of this experiment are shown in FIG. 1 as a graph of Perfume Fraction Remaining versus Time (hours).

25

Four test samples are prepared having the following compositions, by weight:

Test Sample #1: 70% paraffin wax and 30% perfume

Test Sample #2: 49% paraffin wax, 21% mineral oil, and 30% perfume

Test Sample #3: 70% mineral oil and 30% perfume

Test Sample #4: 100% perfume

30

Approximately 29 grams of each test sample is placed in separate round aluminum pans, each pan having a diameter of 10 centimeters. The total mass of the pan containing the test sample is measured initially and then stored in a laboratory hood at room temperature. The total mass of the pan containing the test sample is then measured at the following time intervals: 1.5 hours, 3.5 hours, 22.5 hours, 46.5 hours, and 70.5 hours. At each time interval, the total mass at the given

time interval is determined. This is subtracted from the total mass measured initially to calculate the mass of perfume lost at the given time interval. Subtracting the mass of perfume lost from the initial mass of perfume gives the mass of perfume remaining, which is then divided by the initial mass of perfume, and this value is reported as the "Perfume Fraction Remaining". After the data is collected, the results are plotted in terms of "Perfume Fraction Remaining" as a function of "Time (hours)".

The results for Test Samples #1-4 are shown in FIG.1. The graph in FIG. 1 shows that combining the perfume with an additive material having a melting point of at least about -15°C, here paraffin wax having a melting point of about 50°C, is significant in altering the perfume volatilization rates, as compared to additive material having a melting point of less than about -15°C, here mineral oil having a melting point of -18°C, or with no additive material present at all.

**WHAT IS CLAIMED IS:**

1. A cleaning sheet comprising:
  - (a) a substrate;
  - (b) perfume; and
  - (c) additive material having a melting point of at least about  $-15^{\circ}\text{C}$ ;wherein said perfume and said additive material are affixed to said substrate.
2. A cleaning sheet according to Claim 1 wherein said additive material comprises a wax.
3. A cleaning sheet according to Claim 2 wherein said wax is selected from the group consisting of synthetic waxes, natural waxes, and mixtures thereof.
4. A cleaning sheet according to Claim 2 wherein said wax is present on said substrate at a level of from about  $0.04\text{ g/m}^2$  to about  $35\text{ g/m}^2$ , by weight of said cleaning sheet.
5. A cleaning sheet according to Claim 2 wherein said perfume is present on said substrate at a level of from about  $0.015\text{ g/m}^2$  to about  $5\text{ g/m}^2$ , by weight of said cleaning sheet.
6. A cleaning sheet according to Claim 2 wherein said additive material and said perfume are present on said substrate at a ratio of said additive material to said perfume of from about 1:2 to about 30:1.
7. A cleaning sheet according to Claim 2 wherein said additive material further comprises an oil and wherein said additive material comprises a ratio of said wax to said oil of from about 99:1 to about 1:99..
8. A cleaning sheet according to Claim 1 wherein said additive material has a melting point of from about  $20^{\circ}\text{C}$  to about  $90^{\circ}\text{C}$ .
9. A cleaning sheet according to Claim 1 wherein said perfume and said additive material are blended together and affixed to said substrate, wherein said blend of said perfume and said additive material has a melting point of at least about  $20^{\circ}\text{C}$ .

10. A cleaning sheet according to Claim 9 wherein said blend of said perfume and said additive material has a melting point of at least about 25°C.
11. A cleaning sheet according to Claim 1 wherein said additive material is substantially non-aqueous.
12. A cleaning sheet according to Claim 1 wherein said additive material is essentially free of cationic surfactant.
13. A cleaning sheet according to Claim 1 wherein said substrate is a nonwoven substrate.
14. A cleaning sheet according to Claim 13 wherein said nonwoven substrate comprises hydroentangled synthetic fibers.
15. A cleaning sheet according to Claim 1 wherein said substrate is a heat-bonded substrate.
16. A cleaning sheet according to Claim 15 wherein said heat-bonded substrate comprises a base sheet and at least one layer comprising filaments oriented in one direction, said base sheet and said layer being bonded together at a plurality of bonding lines extending in a direction intersecting with said one direction, said base sheet being cut together with said layer at a plurality of cutting portions aligned intermittently in said intersecting direction, thereby forming a plurality of brushing portions with said filaments positioned between said bonding lines and said cutting portions in said one direction.
17. A cleaning sheet according to Claim 1 wherein said substrate has a total aggregate basis weight of from about 20 g/m<sup>2</sup> to about 275 g/m<sup>2</sup>.
18. A method of removing debris from a surface comprising the step of contacting said surface with a cleaning sheet according to Claim 1.
19. A method of imparting perfume odor to a surface comprising the step of contacting said surface with a cleaning sheet according to Claim 1.

20. A process of manufacturing a cleaning sheet having long-lasting perfume odor, said process comprising the steps of:

- (a) providing a substrate;
- (b) applying a perfume to said substrate;
- (c) heating an additive material having a melting point of at least about  $-15^{\circ}\text{C}$  to at least a temperature wherein said additive material becomes liquid; and
- (d) applying said additive material to said substrate.

1/1

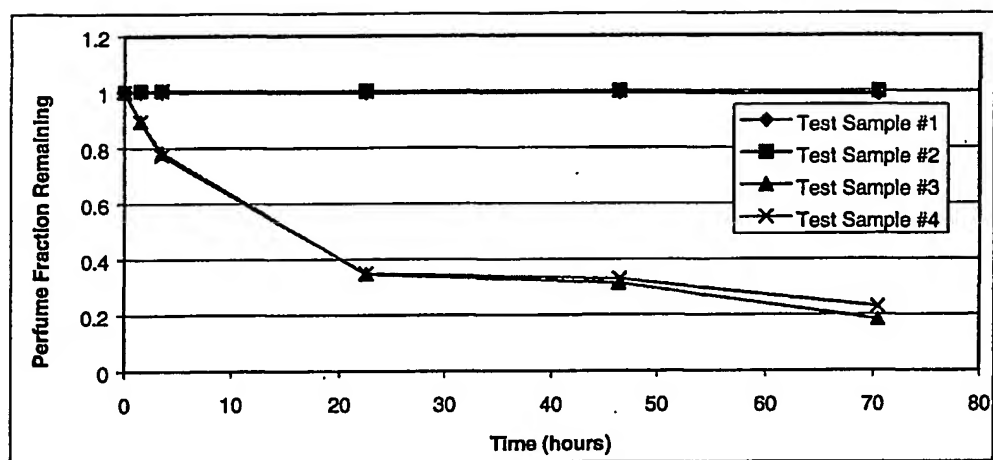


FIG. 1

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/11394

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C11D17/04 A47L13/17

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	EP 1 147 734 A (PROCTER & GAMBLE) 24 October 2001 (2001-10-24) claims; figures	1-19
X	WO 00 27271 A (PROCTER & GAMBLE) 18 May 2000 (2000-05-18) page 40, line 1 - line 35 page 76, line 1 -page 77, line 3	1,8,9, 11-19
X	GB 1 374 272 A (JOHNSON & JOHNSON) 20 November 1974 (1974-11-20) claims; example	1,2,19, 20
X	US 3 619 251 A (STILES NORMAN S SR) 9 November 1971 (1971-11-09) claims 1,4	1,19,20
	--- -/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

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\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the International filing date but later than the priority date claimed

\*T\* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

\*Z\* document member of the same patent family

Date of the actual completion of the International search

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## INTERNATIONAL SEARCH REPORT

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 40 11 928 A (CHAMBET MONIKA) 27 June 1991 (1991-06-27) column 1, line 14 - line 28; claims ---	1-3
A	EP 0 357 496 A (COLGATE PALMOLIVE CO) 7 March 1990 (1990-03-07) claims 1-3 ---	1,11-15
A	DE 297 02 433 U (KAHNES & CO VLIESSTOFFWERK) 27 March 1997 (1997-03-27) claims -----	1,11,12, 19



## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/11394

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1147734	A	24-10-2001	EP 1147734 A2	24-10-2001
			AU 740795 B2	15-11-2001
			AU 7584798 A	11-12-1998
			AU 7584898 A	11-12-1998
			BR 9809155 A	01-08-2000
			CN 1264278 T	23-08-2000
			CN 1264279 T	23-08-2000
			DE 69802798 D1	17-01-2002
			EP 0983014 A1	08-03-2000
			EP 0986322 A1	22-03-2000
			ES 2167077 T3	01-05-2002
			HU 0003717 A2	28-02-2001
			JP 2001527454 T	25-12-2001
			JP 2001527455 T	25-12-2001
			NO 995728 A	24-01-2000
			NO 20001156 A	07-03-2000
			RU 2176143 C2	27-11-2001
			TR 9902876 T2	21-02-2000
			TR 200000246 T2	21-07-2000
			WO 9852458 A1	26-11-1998
			WO 9852459 A1	26-11-1998
			US 2001055926 A1	27-12-2001
			ZA 9804330 A	11-11-1999
			ZA 9804333 A	30-11-1998
			HU 0002693 A2	28-12-2000
WO 0027271	A	18-05-2000	US 6206058 B1	27-03-2001
			US 6142750 A	07-11-2000
			AU 1710800 A	29-05-2000
			AU 1816200 A	29-05-2000
			BR 9915162 A	14-08-2001
			CN 1325363 T	05-12-2001
			EP 1129025 A1	05-09-2001
			EP 1146809 A2	24-10-2001
			WO 0027746 A1	18-05-2000
			WO 0027271 A2	18-05-2000
			US 2001013381 A1	16-08-2001
			AU 2346600 A	19-06-2000
			BR 9915766 A	04-09-2001
			CN 1328490 T	26-12-2001
			CZ 20011770 A3	13-02-2002
			EP 1135214 A1	26-09-2001
			PL 347931 A1	22-04-2002
			SK 6932001 A3	03-12-2001
			TR 200101530 T2	21-11-2001
			WO 0032315 A1	08-06-2000
			US 6328543 B1	11-12-2001
			US 2001046407 A1	29-11-2001
			AU 7716300 A	30-04-2001
			AU 7717100 A	30-04-2001
			AU 7986400 A	30-04-2001
			EP 1215988 A2	26-06-2002
			EP 1215987 A1	26-06-2002
			GB 2363320 A	19-12-2001
			WO 0122861 A2	05-04-2001
			WO 0123510 A2	05-04-2001
			WO 0122860 A1	05-04-2001

INTERNATIONAL SEARCH REPORT  
information on patent family members

International Application No  
PCT/US 02/11394

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 1374272	A	20-11-1974	NONE	
US 3619251	A	09-11-1971	NONE	
DE 4011928	A	27-06-1991	DE 4011928 A1	27-06-1991
EP 0357496	A	07-03-1990	US 4931201 A	05-06-1990
			AT 105691 T	15-06-1994
			AU 627486 B2	27-08-1992
			AU 4012589 A	08-03-1990
			CA 1327681 A1	15-03-1994
			DE 68915371 D1	23-06-1994
			DK 432589 A	03-03-1990
			EP 0357496 A2	07-03-1990
			FI 894141 A ,B,	03-03-1990
			GR 89100543 A ,B	31-10-1990
			JP 2161925 A	21-06-1990
			NO 893528 A	05-03-1990
			NZ 230378 A	25-10-1991
			PT 91594 A ,B	30-03-1990
			ZA 8906413 A	24-04-1991
DE 29702433	U	27-03-1997	DE 29702433 U1	27-03-1997

(19) World Intellectual Property Organization  
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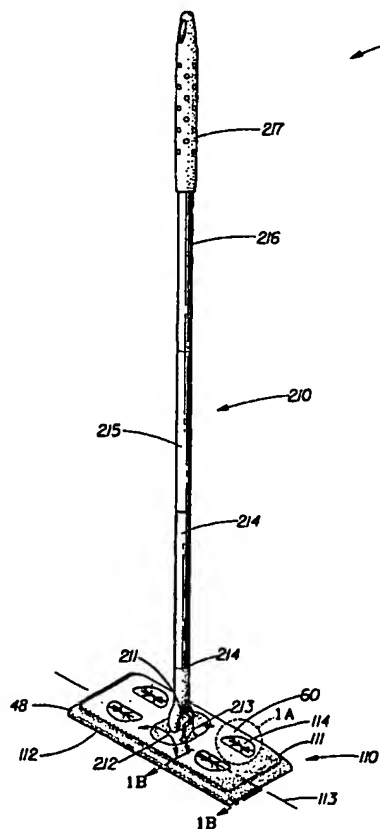
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[Continued on next page]

(54) Title: **ADAPTER PLATE FOR CLEANING IMPLEMENT**



(57) Abstract: Adapter plates (30) which can be used with a cleaning implement (10) are provided. These adapter plates (30) can be removably attached to a dry or wet cleaning implement (10) in order to allow a consumer to use longer and/or larger sheets or pads (310) without having to purchase a complete cleaning implement. These adapter plates (30) may have elevational elements (1630, 1631) at the bottom surface to improve the efficiency of cleaning by creating pressure zones in the sheet or pad (310). These adapter plates (30) may also have a scrubbing element secured at one edge of the plate for heavy stain removal.

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SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

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## ADAPTER PLATE FOR A CLEANING IMPLEMENT.

### CROSS-REFERENCE TO RELATED APPLICATIONS

5

This application claims the benefit of U.S. Application Serial number 09/723,026, filed November 27, 2000, by Nicola Policicchio which is a Continuation-in-part of International Application Serial No. PCT/US99/26579 filed November 9, 1999 (P&G case 7368+) by Policicchio et al. which claims the benefit of U.S. Provisional Application Serial number 60/162,935 filed November 2, 1999 by Policicchio et al and U.S. Provisional Application Serial No. 60/110,476 filed December 1, 1998 by Policicchio et al. This application also claims the benefit of U.S. Application Serial number 09/723,025, filed November 27, 2000, by Nicola Policicchio which is a Continuation-in-part of International Application Serial No. PCT/US99/26579 filed November 9, 1999 (P&G case 7368+) by Policicchio et al. This application also claims the benefit of U.S. Application Serial number 09/831,480, filed November 9, 1999 by Policicchio et al. This application also claims the benefit of U.S. Application Serial number 09/788,761, filed February 20, 2001 by Willman et al. and U.S. Provisional Application Serial No. 60/184,780 filed February 24, 2000 to Willman et al (P&G case 7973P). All the foregoing patent applications are hereby incorporated by reference: U.S. Application Serial No. 09/188,604 filed November 9, 1998 by Nagel et al. (P&G Case 7337); U.S. Application Serial No. 09/201,618 filed November 30, 1998 by Benecke (P&G Case 7361); and U.S. Provisional Application Serial No. 60/156,286 filed September 27, 1999 by Sherry et al. (P&G Case 7803P).

25

### TECHNICAL FIELD

The present invention relates to adapters for cleaning implements used with cleaning sheets or pads particularly suitable for removal and entrapment of dust, lint, hair, food crumbs, grass and the like.

30

### BACKGROUND OF THE INVENTION

The use of cleaning implements such as mops for cleaning hard surfaces is known in the art. Modern mops typically comprise a handle connected to a mop head, which engages a disposable cleaning sheet, and the user then wipes the cleaning sheet against the surface to be cleaned. Those mops have typically a flat surface at the bottom, they have fixed dimensions and they are "specialized" in the sense that they can only be used for certain tasks such as wet cleaning or dry cleaning. Depending on the kind of cleaning that is wanted, a user is often obliged to possess mops of different sizes that can be used with different sets of sheets, and/or mops that can be used for wet or dry cleaning. It is therefore one object of this invention to provide accessories to be used with existing mop implements that will allow the user to perform the desired cleaning tasks without the burden of having to possess several implements.

### SUMMARY OF THE INVENTION

An adapter plate that can be used with a cleaning implement is provided. The adapter plate has a top and a bottom surface, a leading and a trailing edge, and can be removably attached to the mop head of a cleaning implement. The adapter plate also includes securing elements which are used to removably attach a cleaning pad or a cleaning sheet.

### BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view of a preferred floor mop for dry cleaning made in accordance with the present invention;

Fig. 1A is a top view of an attachment structure capable of retaining a cleaning pad or sheet made in accordance with the present invention;

Fig. 1B is a cross-section of an attachment structure included in a mop head;

Fig. 2 is a perspective view of the floor mop of Fig. 1, wherein a sheet is attached to the mop head;

Fig. 3 is a perspective view of a preferred floor mop for wet cleaning made in accordance with the present invention;

Fig. 3a is a bottom view of the preferred wet cleaning mop of Fig. 3a;

Fig. 4 is top view of a dry dusting adapter plate made in accordance with the present invention;

Fig. 5 is a front view of the dry dusting adapter plate of Fig. 4;

Fig. 6 is a top view of another preferred adapter plate made in accordance with the present invention;

Fig. 7 is a front view of the adapter plate of Fig. 6;

Fig. 8 is a top view of another preferred adapter plate made in accordance with the present invention;

Fig. 9 is a front view of the adapter plate of Fig. 8;

Fig. 10 is a side view of another preferred adapter plate made in accordance with the present invention;

Fig. 11 is a top view of another preferred adapter plate made in accordance with the present invention;

Fig. 12 is a side view of the adapter plate of Fig. 11;

Fig. 13 is top view of an expansion adapter plate made in accordance with the present invention;

Fig. 14 is a bottom view of the adapter plate of Fig. 13;

Fig. 15 is a front of the adapter plate of Fig. 13;

Fig. 16 is a front view of the adapter plate of Fig. 13 shown attached to a wet cleaning during use;

Fig. 17 is a front view of another preferred expansion adapter plate made in accordance with the present invention;

Fig. 18 is a bottom view of the adapter plate of Fig. 17;

Fig. 19 is a front view of another preferred expansion adapter plate made in accordance with the present invention;

Fig. 20 is a bottom view of the adapter plate of Fig. 19;

Fig. 21 is a schematic representation of the bottom of a cleaning pad having been used with a flat adapter plate;

Fig. 22 is a schematic representation of the bottom of a cleaning pad having been used with one embodiment of the present invention;

Fig. 23 is top view of a scrubbing adapter plate made in accordance with the present invention;

Fig. 24 is a side view of the adapter plate of Fig. 23;

Fig. 25 is a bottom view of the adapter plate of Fig. 23;

5 Fig. 26 is a side view of the adapter plate of Fig. 23 showing the scrubbing element in the downward position;

Fig. 27 is a side view of the adapter plate of Fig. 23 showing the scrubbing element in the upward position; and

Fig. 28 is a front view of a carpet plate made in accordance with the present invention.

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## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

### Definitions

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As used herein, the term "comprising" means that the various components, ingredients, or steps, can be conjointly employed in practicing the present invention. Accordingly, the term "comprising" encompasses the more restrictive terms "consisting essentially of" and "consisting of."

10

As used herein, the term "direct fluid communication" means that fluid can transfer readily between two cleaning pad components or layers (e.g., the scrubbing layer and the absorbent layer) without substantial accumulation, transport, or restriction by an interposed layer. For example, tissues, nonwoven webs, construction adhesives, and the like can be present between the two distinct components while maintaining "direct fluid communication", as long as they do not substantially impede or restrict fluid as it passes from one component or layer to another.

15

As used herein, the term "macroscopically expanded", when used to describe three-dimensional plastic webs, ribbons, and films, refers to webs, ribbons, and films which have been caused to conform to the surface of a three-dimensional forming structure so that both surfaces thereof exhibit the three-dimensional pattern of said forming structure, said pattern being readily visible to the naked eye when the perpendicular distance between the viewer's eye and the plane of the web is about 12 inches. Such macroscopically expanded webs, ribbons and films are typically caused to conform to the surface of said forming structures by embossing, i.e., when the forming structure exhibits a pattern comprised primarily of male projections, by debossing, i.e., when the forming structure exhibits a pattern comprised primarily of female capillary networks, or by extrusion of a resinous melt directly onto the surface of a forming structure of either type. By way of contrast, the term "planar", when utilized herein to describe plastic webs, ribbons and films, refers to the overall condition of the web, ribbon or film when viewed by the naked eye on a macroscopic scale. In this context, "planar" webs, ribbons and films can include webs, ribbons and films having fine scale surface aberrations on one or both sides, said surface aberrations not being readily visible to the naked eye when the perpendicular distance between the viewer's eye and the plane of the web is about 12 inches or greater.

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As used herein, the term "z-dimension" refers to the dimension orthogonal to the length and width of the cleaning pad of the present invention, or a component thereof. The z-dimension therefore corresponds to the thickness of the cleaning pad or a pad component.

As used herein, the term "x-y dimension" refers to the plane orthogonal to the thickness  
5 of the cleaning pad, or a component thereof. The x and y dimensions correspond to the length and width, respectively, of the cleaning pad or a pad component. In general, when the cleaning pad is used in conjunction with a handle, the implement will be moved in a direction parallel to the y-dimension (or width) of the pad. Of course, the present invention is not limited to cleaning pads having four sides. Other shapes, such as circular, elliptical, and the like, can also be used. When  
10 determining the width of the pad at any point in the z-dimension, it is understood that the pad is assessed according to its intended use.

As used herein, the term "layer" refers to a member or component of a cleaning pad whose primary dimension is x-y, i.e., along its length and width. It should be understood that the term layer is not necessarily limited to single layers or sheets of material. Thus a layer can  
15 comprise laminates or combinations of several sheets or webs of the requisite type of materials. Accordingly, the term "layer" includes the terms "layers" and "layered."

As used herein, the term "hydrophilic" is used to refer to surfaces that are wettable by aqueous fluids deposited thereon. Hydrophilicity and wettability are typically defined in terms of contact angle and the surface tension of the fluids and solid surfaces involved. This is discussed in  
20 detail in the American Chemical Society publication entitled Contact Angle, Wettability and Adhesion, edited by Robert F. Gould (Copyright 1964), which is hereby incorporated herein by reference. A surface is said to be wetted by a fluid (i.e., hydrophilic) when either the contact angle between the fluid and the surface is less than 90°, or when the fluid tends to spread spontaneously across the surface, both conditions normally co-existing. Conversely, a surface is considered to be  
25 "hydrophobic" if the contact angle is greater than 90° and the fluid does not spread spontaneously across the surface.

As used herein, the term "scrim" means any durable material that provides texture to the surface-contacting side of the cleaning pad's scrubbing layer, and also has a sufficient degree of openness to allow the requisite movement of fluid to the absorbent layer of the cleaning pad.  
30 Suitable materials include materials that have a continuous, open structure, such as synthetic and wire mesh screens. The open areas of these materials can be readily controlled by varying the number of interconnected strands that comprise the mesh, by controlling the thickness of those interconnected strands, etc. Other suitable materials include those where texture is provided by a discontinuous pattern printed on a substrate. In this aspect, a durable material (e.g., a synthetic)

can be printed on a substrate in a continuous or discontinuous pattern, such as individual dots and/or lines, to provide the requisite texture. Similarly, the continuous or discontinuous pattern can be printed onto a release material that will then act as the scrim. These patterns can be repeating or they can be random. It will be understood that one or more of the approaches  
5 described for providing the desired texture can be combined to form the optional scrim material. The z direction height and open area of the scrim and or scrubbing substrate layer help to control and or retard the flow of liquid into the absorbent core material. The z height of the scrim and or scrubbing substrate help provide a means of controlling the volume of liquid in contact with the cleaning surface while at the same time controlling the rate of liquid absorption, fluid  
10 communication into the absorption core material.

For purposes of the present invention, an "upper" layer of a cleaning pad is a layer that is relatively further away from the surface that is to be cleaned (i.e., in the implement context, relatively closer to the implement handle during use). The term "lower" layer conversely means a layer of a cleaning pad that is relatively closer to the surface that is to be cleaned (i.e., in the  
15 implement context, relatively further away from the implement handle during use). As such, the scrubbing layer is preferably the lower-most layer and the absorbent layer is preferably an upper layer relative to the scrubbing layer. The terms "upper" and "lower" are similarly used when referring to pads that are multi-ply (e.g., when the scrubbing layer is a two-ply material). In terms of sequential ordering of layers (e.g., first layer, second layer, and third layer), a first layer is a  
20 "lower" layer relative to a second layer. Conversely, a third layer is an "upper" layer relative to a second layer. The terms "above" and "below" are used to describe relative locations of two or more materials in a cleaning pad's thickness. By way of illustration, material A is "above" material B if material B is positioned closer to the scrubbing layer than material A. Similarly, material B is "below" material A in this illustration.

25 All of the documents and references referred to herein are incorporated by reference, unless otherwise specified. All parts, ratios, and percentages herein, in the Specification, Examples, and Claims, are by weight and all numerical limits are used with the normal degree of accuracy afforded by the art, unless otherwise specified.

Reference will now be made in detail to the present preferred embodiments of the  
30 invention, examples of which are illustrated in the accompanying drawings wherein like numerals indicate the same elements throughout the views and wherein reference numerals having the same last two digits (e.g., 20 and 120) connote similar elements.

While the present invention is discussed herein with respect to a dry or wet cleaning mop for purposes of simplicity and clarity, it will be understood that the present invention can be used with other types of mops and cleaning implements which are used with a cleaning sheet or pad releasably secured there about.

5 Referring to Figs. 1 and 2, a typical dry cleaning floor mop 10 which can be used with the present invention is illustrated. The floor mop 10 comprises a mop head 110 having a leading edge 111 and a trailing edge 112 and a handle member 210. As used herein, the term "leading edge" is intended to refer to the furthest edge of the mop head 110 which leads the mop head 110 when it is moved in a forward direction away from its user. Likewise, the term "trailing edge" 10 112 is intended to refer to the furthest edge of the mop head 110 which trails the mop head 110 when it is moved in a forward direction away from its user. For most floor mops, the leading edge 111 and the trailing edge 112 are substantially parallel to the longitudinal axis 113 (or x dimension) of the mop head 110, as shown in Fig. 1, wherein the longitudinal axis 113 is the axis along the length of the mop head 110. A pivotable joint, such as the universal joint 211, 15 interconnects the handle 210 of the mop 10 with the mop head 110. The universal joint 211 comprises two rotational axes that allow the handle 210 to pivot in directions 212 and 213. The handle 210 is threadably interconnected with the universal joint 211 at the connection 214. The handle 210 can be provided as a unitary structure or can comprise three sections 214, 215, and 216 which are threadably interconnected with each other so that the floor mop 10 can be shipped 20 within a carton of convenient size and later assembled for use. The handle section 216 can be provided with an elastic and resilient portion 217 suitable for gripping by a user of the floor mop 10. The mop head 110 also comprises a plurality of securing elements 114. The securing elements 114 are configured to receive and retain a cleaning sheet or pad 310 about the mop head 210, as shown in Fig. 2, during use. Four securing elements 310 are preferably disposed at the 25 corners of the mop head 110, although the number and the location of these securing elements can be varied depending upon the size and shape of the mop head 110. The securing elements 114, one of which is represented with greater details in Fig. 1A and 1B, are preferably provided in the form of an attachment structure which is described in copending US application no. 09/364,714, filed August 13, 1999, to Kingry, et al., which is hereby fully incorporated herein by 30 reference. One skilled in the art will understand that other kinds of securing elements may be used and provide the same benefits. Preferably, an attachment structure comprises a base triangle 1114 which is defined along two sides thereof by slits which extend through a flexible material which forms the attachment structure. The apex of the base triangle formed by the intersection of the slits is preferably disposed adjacent a side of the mop head 110, although the apex of the base

triangle can be disposed adjacent the longitudinal axis of the mop head. The attachment structure also preferably comprises a plurality of pie-shaped sections 2114 having apexes which meet at a substantially common point. The pie-shaped sections are defined along two sides thereof by slits which extend through the flexible material from which the attachment structure is formed. This arrangement permits the pie-shaped sections 2114 to individually deflect relative to each other. The common point is preferably disposed adjacent the slits defining the base triangle. The slits through the flexible material of the attachment structure 114 allow the pie-shaped sections 2114 and the base triangle 1114 to deflect under finger pressure so that a portion of the sheet can be pushed through the top surface of the attachment structure and into a cavity 3114 formed within the attachment structure. As the sheet is pushed past the top surface of an attachment structure, the apexes of the pie-shaped sections and the apex of the base triangle can pierce and engage the sheet such that the sheet is retained about the mop head during use. The ends of the slits which define the base triangle and each of the pie-shaped sections preferably terminate with a substantially circular opening 4114. The circular openings can prevent stress cracking, which can be caused by repeated deflections of the attachment structure's flexible material at the slit terminations of the pie-shaped sections and the base triangle during use.

Without the adapter plate of the present invention, a floor mop 10 is usually used in combination with a disposable cleaning sheet 310 which is releasably attached to the mop head 110 using for example slitted attachment structures 114 as represented in Fig. 2.

Referring to Fig. 3 and in accordance with one aspect of the present invention, a typical wet cleaning mop is represented. The wet cleaning mop 20 comprises a handle 220, a support head or mop head 320 attached to the handle by a universal joint 221, and a container 222 in fluid communication with a liquid delivery system (not represented in the Figure) which includes at least a spray nozzle 321 preferably attached to the mop head 320. Such an arrangement is described in U.S. patent no. 5,888,006 to Ping, et al., issued March 30, 1999, the substance of which is fully incorporated herein by reference. Without the adapter plate of the present invention, a wet cleaning mop 20 is usually used in combination with an absorbent cleaning pad, preferably disposable, such as for example one described previously and which is releasably attached to the mop head 320 using Velcro® loops provided on the top surface of the pad and capable of engaging Velcro® hooks 322 provided on the bottom surface of the mop head. One skilled in the art will understand that Velcro® loops are considered to be female fasteners and Velcro® hooks are considered to be male fasteners.

As discussed more fully hereafter, one aspect of the present invention is directed to adapter plates (which in one of the embodiments can be considered to be a "dry dusting plate") which allow a wet mop to be used with dry dusting or sweeping sheets. The benefits of performing dry cleaning followed by wet cleaning have been discussed in previously filed International Application Serial No. PCT/US99/26579 filed November 9, 1999 by, Policicchio, et al, incorporated herein by reference. It has been found that when an efficient sweeping/dry mopping with dry dusting sheets is done prior to wet mopping, the end result is substantially improved compared to any of those operations done alone. It has also been found that when the wet mopping operation is done using a disposable absorbent pad, the benefits are magnified. It has been found that by reducing the particulate load on the floor with an efficient dry sweeping/mopping operation, the burden put on the pad is decreased and as a result its potential efficiency and "life expectancy" measured by the total surface which can be cleaned with a single pad is increased. However, despite the greater benefits provided by a dry cleaning followed by a wet cleaning, some consumers may find it inconvenient to have multiple implements in their household due to limited storage availability, multiple handling and cost. This concern of having two different implements can be addressed by either creating a disposable wet mopping pad with attachment flaps that allow it to be secured to the attachment structures of an existing dry dusting implement such as the SWIFFER® cleaning implement (for dust cleaning) or by adding attachment structures such as grippers to the top of a WET JET® like implement (for wet cleaning) which uses Velcro® hooks at the bottom of the mop head capable of engaging the Velcro® loops on a disposable wet mopping pad. Those attachment structures are more fully described in copending US application no. 09/364,714, filed August 13, 1999, to Kingry, et al., the substance of which is hereby fully incorporated herein by reference. However, while this solution seems to be a better solution than having two separate implements, it is still not ideal. For example, when a dry mop implement is used with a disposable wet mopping pad, the handle's characteristics of the mop may not be appropriate to endure the stress applied to the handle during wet cleaning due to the handle limited strength and pole length. In addition, this solution may render the two step cleaning impractical. All the accessories needed to perform this two step cleaning, i.e., dry followed by wet cleaning, would become somehow too cumbersome since the user would need to dispense liquid by using a hand held sprayer or a squirt bottle. While a wet cleaning implement may not have any of the handle strength or length issues and while it is more practical to use since the liquid is directly carried and dispensed from the mop, simply adding attachment structures to the mop head in order to allow it to be used with dry cleaning sheets can also lead to problems. Specifically, the consumer would have to be cautious and avoid

having the dry dusting sheet come into direct contact with the Velcro® hooks, which are typically used at the bottom of the wet cleaning implement to attach an absorbent pad, or the hooks may become contaminated with fibers from the dry cleaning sheet and potentially render the wet mop inoperable. In order to prevent contamination of the hooks, each time a consumer wants to perform dry cleaning with a wet mop, the user will have to first attach a disposable wet mopping pad which will act as a barrier between the dry dusting sheet and the hooks. The dry dusting sheet is then wrapped around the pad and tucked into the attachment structures that have been built into the top of the mop head. This solution is quite inconvenient for the user. In order to avoid this problem, an adapter plate in the form of a dry dusting plate which gives to the consumer the convenience and flexibility to easily switch from dry dusting to wet mopping with the same implement has been invented.

Referring to Fig. 4, an adapter plate 30 allowing a wet mop to be used for dry cleaning is illustrated. An adapter plate 30 comprises a substantially rectangular plate 130 comprising at least one attachment structure 114 capable of retaining a sheet (not shown for clarity). One skilled in the art will understand that the adapter plate 30 can have many other shapes and still provide the same benefits. In the illustrated embodiment, the plate 130 comprises four attachment structures 114 located on the top of the plate at about the four corners of the plate. Those attachment structures may be located on the top or on the bottom surface of the adapter plate. The plate 130 also comprises Velcro® loops 230 attached to the top surface of the plate 130 and capable of removably securing the adapter plate 30 to the bottom of the mop head 320 of a wet mop 20, shown in Fig. 3, by engaging Velcro® hooks 322 already built into the bottom of the mop head. While the adapter plate of this embodiment uses Velcro® loops to attach directly to Velcro® hooks located at the bottom of the mop head, in the event the mop head does not include Velcro® hooks or loops, other kinds of securing means may be used and provide the same benefits. Such securing means may be, for example, grippers 114 located at top of mop head. The cleaning sheet is then wrapped around the dry dusting adapter plate 30 and tucked into place in the attachment structures 114 of the mop head. In the event the mop head does not already include built in Velcro® hooks or loops, Velcro® hooks and loops can also be sold as part of an adapter plate kit such that these can be removably attached to bottom of a mop head by the consumer. Alternatively, the adapter plate 30 can also include other securing means such as straps or belts which would be wrapped around the mop head and the adapter plate 30 to secure the plate in place. These straps can comprise, for example, Velcro® loops on one strap and Velcro® hooks

on the opposite strap such that they can allow the dry dusting plate to be quickly attached and removed from mop head.

A dry dusting adapter plate 30 represented in Fig. 4 and 5 is sized such that it is longer (relative the x dimension) than the mop head of a wet cleaning implement 20 and has substantially the same width (relative the y dimension). An adapter plate 30 which is longer than the mop head 320 of an implement gives the ability to use the cleaning implement with longer dry dusting sheets so that a greater surface area can be covered with a fewer number of wiping strokes. In another embodiment of the invention, the adapter plate 30 is wider than the mop head and has a length which is not greater than the mop head's length. In yet another embodiment of the invention, the adapter plate is both wider and longer than the mop head of the cleaning implement. It has been found that for securing purposes it is beneficial to have a notch 330 cut out in the plate as represented in Fig. 6 and 7. Additionally, it has been found that adding a specific geometric shape to the bottom of the adapter plate 30 or having a textured surface at the bottom of the plate can make the plate even more beneficial for effective collection of dry particulate. For example, a crown design or a step design may be incorporated as described in Provisional U.S. application serial number 60/184,780 to Willman, et al., and U.S. application serial number 09/723,026 to Policicchio incorporated herein by reference. An adapter plate with a step design comprises an elevational element 430. This embodiment is schematically represented in Fig. 8 and 9. In yet another embodiment of the invention schematically represented in Fig. 10, the bottom of the plate is beveled and comprises a substantially flat centered elevational element 430 and angled sides 1430. The material used for the bottom of the adapter plate may be either substantially rigid or flexible.

In another embodiment of the invention schematically represented in Fig. 11 and 12, the "dry dusting" adapter plate 30 comprises a lower portion 430 which is facing the surface to be cleaned (i.e. x-y dimension) and at least one side panel 530 which extends from one edge of the plate 130 and away from the surface to be cleaned (i.e. in the z dimension). The side panel is angled relative the lower portion of the plate. In this embodiment, the attachment structures are located on the side panel 530 of the plate. In a preferred embodiment, the "dry dusting" adapter plate comprises two side panels 530 substantially perpendicular to the plate 130 and facing each other with two attachment structures 114 on each side panel. The dry dusting sheet is attached by wrapping it around the adapter plate and then securing it to the plate 30 with the attachment structures 114. This embodiment with side panels 530 is particularly useful since it allows for a better coverage and use of a dry dusting sheet, and it allows baseboards to be dusted at the same time the floor is dusted. This embodiment also allows current regular size dusting sheets, which



are already on the market, to fit easily onto a plate which has a coverage surface substantially similar to the coverage surface of an existing dry dusting mop head. As a result, there is no need in this case to redesign and manufacture new dry dusting sheets.

5           The present invention further encompasses articles of manufacture comprising the above-described dry dusting adapter in association with a set of instructions, which can be combined with a package, carton, or other container. As used herein, the phrase "in association with" means the set of instructions are either directly printed on the adapter plate itself or presented in a separate manner including, but not limited to, a brochure, print advertisement, electronic  
10 advertisement, and/or verbal communication, so as to communicate the set of instructions to a consumer of the article of manufacture. The set of instructions preferably comprise the instruction to use the dry dusting adapter plate for hard surface cleaning with a wet cleaning implement, such as a floor mop, having a handle and a mop head. For example, the instruction might instruct using the cleaning sheet with a wet cleaning implement having Velcro® hooks at the bottom. Other  
15 instructions might instruct a user to keep a dry dust sheet always attached to the adapter plate to facilitate switching from dry to wet cleaning. Other instructions might instruct a user to first perform the dry cleaning operation with the adapter plate and a dry dusting sheet and then, after having removed the adapter plate, to perform a wet cleaning operation with a wet cleaning implement with an absorbent pad.

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As discussed more fully hereafter, another aspect of the present invention is directed to adapter plates (which in one of the embodiments can be considered to be a "expansion plate"), which allow a wet cleaning mop to be used with wider or longer mopping pads and a dry cleaning mop to be used with wider or longer dry dusting sheets.

25           As discussed previously, one of the benefits associated with performing the mopping operation with a wider/longer pad or sheet is that it makes cleaning of a surface faster and easier since more area can be covered with fewer wiping strokes. In addition, during the course of wet mopping, a liquid solution is typically sprayed on the surface to be cleaned. As a result, it becomes important that the consumer overlap the wiping strokes in order to get even coverage  
30 during the forward and backward wiping motion. Since the liquid solution can be difficult to see on the surface to be cleaned, the user will often notice puddles of liquid where she missed wiping. This is particularly inconvenient since the user will need to try to avoid stepping in the wet spots left after wiping, and can also lead to poor quality end results caused by the residue left by the liquid and unremoved dirt which dries on the floor. Applicants have discovered that those

problems can be solved by using a wider/longer pad. The amount of puddles on the surface decreases when a wider or longer pad is used since fewer overlapping of wiping strokes is required to clean the same area. In fact if the pad is made long enough, it becomes almost impossible for the consumer not to overlap wiping strokes. With a long enough pad the consumer would need to mop at such an extreme angle to miss over-lapping that it would be too uncomfortable to mop.

The dimensions of a standard size wet mopping pad is typically about 150 mm wide by about 300 mm long. In one embodiment of the invention, the length of a wider/longer pad is increased by at least about 50% of the standard size wet mopping pad to be beneficial but this increase should preferably not exceed about 150% of the length of the standard size wet mopping pad or it may become too cumbersome to push across the floor. The width of the wider/longer pad may either stay the same as the width of the standard pad or may be increased up to about 50% of the width of a standard pad. One skilled in the art will understand that the dimensions of the adapter plate will be such that the plate will allow the user to secure a cleaning pad to the adapter plate 30 and will also allow the cleaning pad to stay substantially in contact with the surface to be cleaned. Applicants have also found that when a wider/longer pad is used, the friction between the surface to be cleaned and the pad are increased, and as a result, the stress applied by the pad on the attachment structure is also increased. In order to better secure the cleaning pad on the mop head, the mop head of the cleaning implement may require an improved attachment mechanism capable of retaining a wider/longer pad while the cleaning is done. In the case of a typical wet cleaning implement where the securing means used to secure a pad to the mop head is usually in the form of Velcro® hooks and loops, one solution is to increase the surface covered by Velcro® material. In another embodiment where the securing means is in the form of attachment structures 114 such as grippers located on top of the mop head or on top of the expansion plate and where attachment wings of the pad or sheet are inserted in those attachment structures, the number or size of these grippers can be increased. In another embodiment, the top of the mop head or expansion plate comprises a set of hinged plates which can be lifted up to provide channels to tuck the attachment wings and then are snapped down to hold those wings in position. In yet another embodiment, an adhesive layer can be added to the top surface of a cleaning pad. The top surface of the cleaning pad is then pressed against the bottom surface of the mop head or expansion plate. One skilled in the art will understand that the amount of adhesive on the cleaning pad and the adhesive strength are such that a cleaning pad will be secured during the cleaning operation, but should still allow a user to remove the pad after

use. In order to prevent the adhesive layer to dry out, and in order to prevent the cleaning pads to stick to each other, a protective release paper can be applied on the top of the adhesive layer

In one embodiment of the invention, the mop head 320 of a wet mopping cleaning implement 20 comprises Velcro® hooks 322 on its bottom surface which are capable of engaging and therefore retaining Velcro® loops 230 located on the top surface of an expansion adapter plate. As described previously, a notch 330 can be cut out of the top part of the expansion adapter plate as described Fig. 11 and 12. This notch is slightly wider than the mop head onto which the expansion plate is attached. One of the benefits of having a notch 330 in the expansion plate is that it keeps the mop head 320 more secure within the expansion plate 30 and allows the mop head to be at a lower position. It has been found that the mop is actually easier to push on the surface to be cleaned when the mop head is lowered. It has also been found that the spray pattern of a cleaning implement comprising a spraying mechanism with a nozzle 321 located on the mop head 320, is optimized when a notch 330 is made on the expansion plate 30 and helps to prevent the formation of puddles of liquid on the surface.

It has been discovered that having a specific topographical design at the bottom of an expansion adapter plate 30 results in a better pad utilization and is therefore beneficial to improve cleaning efficiency and performance. An example of an adapter plate 30 with a specific topographical design at the bottom is schematically represented Fig. 13 through Fig. 16. It has been discovered that creating pressure zones on a cleaning pad by ways of discontinuities 630 in specific locations of the bottom surface of the mop head and/or the expansion plate helps to improve solution absorbency. In the case of the large pad expansion plate, not only is there a need to cause absorption of the liquid through the center of the pad, but there is also a need to cause absorption of liquid at the outer extremities of the pad (relative the x-y dimension). Applicants have found that if the bottom surface of the expansion plate 30 is flat, the addition of a full length elevational element in the center of the expansion plate, as described in U.S. Application Serial number 09/723,026 incorporated herein by reference, is insufficient to cause a liquid solution to be absorbed at the outer extremities of the pad. However, when a notch is also cut out of the bottom surface of the expansion plate such that the notch length is slightly shorter than the length of the mop head attached to the expansion plate, the solution absorbency in the outer extremities of the pad is improved. With such a notch, pressure zones are created across the width of the outer extremities of the pad rather than across the length of a pad, as it is the case with the centered step design extending along the entire length of the mop head. This notch can be formed either during the molding operation of the expansion plate or by securing at least one elevational element 1630 at each extremity of the bottom surface of the expansion plate 30.

In another embodiment of the invention, a succession of notches is cut out of the bottom surface of the expansion plate or a succession of elevational elements 1630 are secured at each extremity of the plate 130. An example of this embodiment is schematically represented Fig. 17 and 18. In this embodiment, the plate 30 is optimized to minimize weight while creating several pressure zones in the pad. The surface discontinuities 630 and 631 on the bottom of the expansion plate 30 create "pressure barriers" in the pad which in turn help the longitudinal transfer of the liquid towards the extremities of the pad. Without intending to be bound by any theory, it is believed that during the forward and backward mopping motion, pressure is alternatively being applied and released on the expansion plate 30 and the pad via the handle. As a result, the pressure zones are successively generating pressure gradients in the pad which alternatively appear and disappear. This alternation acts as a pump in the pad resulting in a more uniform distribution of the liquid along the pad.

In yet another embodiment of the invention, at least two elevational elements 1630 and 1631 having different length and/or width are secured at each extremity of the expansion plate 30. In another embodiment of the invention, the bottom surface of the expansion plate is continuous and is at least partially curved towards the top surface of the expansion plate.

In yet another embodiment of the invention, the bottom surface of the expansion plate 30 also comprises at least one longitudinal elevational element 730 located in the center of the bottom surface and extending along the length of the bottom surface. This embodiment is schematically represented Fig. 19 and 20. This longitudinal elevational element creates a pressure zone in the center portion of the pad relative to its width. When downward pressure is applied to the implement the multiple pressure points created by the multiple elevational elements on the extremities of the plate and full length centered elevational element allow liquid to be uniformly absorbed and distributed in the pad. It has been found that the absorptive efficiency for both longer "standard" cleaning pads and longer "Light duty" cleaning pads is improved when wiping is done with an expansion plate having discontinuities generating pressure zones on the pad as compared with an expansion plate with a flat bottom. By observing the used pads which were tested with each plate, it is apparent that having an expansion plate having discontinuities on its bottom causes the cleaning solution to be absorbed through the longitudinal extremities of the pad and center of the pad rather than at the leading edge and middle portion of the pad. As a result, each cleaning pad tested is capable of absorbing a greater quantity of liquid and thus the cleaning efficiency of the cleaning pad is improved. This observation is schematically illustrated by Fig. 21 which shows where the dirty solution Ds is absorbed on a cleaning pad tested with a flat expansion plate and Fig. 22 which shows where the dirty solution Ds is absorbed on a

cleaning pad tested with an expansion plate having discontinuities. In embodiments of the invention comprising a notch 1630 at the bottom of the expansion adapter plate 30, the portion of the plate which is the thinnest is flexible such that when the plate is used with the implement, enough pressure is applied during the forward and backward mopping motion to make this  
5 portion of the plate at least partially collapse and fill in a hollow area (schematically represented in Fig. 16). As a result, the extremities of the pad are subject to more pressure which, in turn, allows the liquid solution to be better absorbed by the pad.

One skilled in the art will understand that those substantially flat elevational elements (relative the x-y plan) used to create pressure zones in the pad can have other geometries or  
10 designs and still offer the same benefits. For example, the elevational elements can have rounded sides, angled sides and/or be textured. In addition, the bottom of the expansion plate can have a crowned design as previously described. It can also have a crowned design combined with at least one elevational element.

In each embodiment of the invention, the bottom portion of the expansion plate and its  
15 topography can be made of either stiff non-pliable materials such as high density polyethylene and/or more pliable materials, or materials with lower durometry such as foams, sponges, polyester wadding, encased gels or liquids and the like. In one embodiment, the elevational element which is furthest away from the center of the expansion plate which is the most pronounced and is the closest to the floor, can be made of pliable material, while the other  
20 elevational element can be made of a more rigid material. In one embodiment of the invention, the elevational elements of the expansion plate are all made of a rigid material. In this case, the expansion plate may also include a pliable bumper guard located around the circumference of the plate to provide protection when the user is mopping a surface.

In yet another embodiment of the invention, an expansion adapter plate is provided  
25 which allows longer and/or wider cleaning sheets to be used with an existing dry cleaning implement. In this embodiment, the adapter plate comprises at least one, but preferably four attachment structures 114, located on the top surface of the adapter plate, preferably at each corners of the top surface. One skilled in the art will understand that there are several ways to removably attach the expansion adapter plate to the mop head of a dry cleaning implement. For  
30 example, Velcro® straps attached to the adapter plate, rubber bands or any equivalent can be used. In one embodiment of the invention, the top surface of the expansion adapter plate comprises a notch forming a hollow space and having a width and length such that the mop head of a dry cleaning implement can be forceably lodged in this hollow space and forceably removed from this hollow space.

Providing specific instructions for use with the larger head expansion plates can be beneficial. For example it has been found that when using the larger head expansion plate with a disposable absorbent mopping pad, the increased size of the mop head makes it difficult to clean in smaller rooms or in tighter spaces. As a result, in order to provide a better cleaning experience, consumers will be instructed to first clean with a regular size pad on a current mop in all the small rooms and tight spaces such as under furniture etc. Consumers will be then instructed to remove the regular size pad, attach the larger head expansion plate to the implement with a larger pad and then finish cleaning in the wider open areas. In fact, this flexibility of being able to quickly convert the implement from a regular size to a large size, and vice-versa, adds to the convenience. In order to provide a better value and better hygiene to the consumers, one option is to sell the larger head expansion plate as part of a kit which can include larger size pads and light duty standard size pads for use in smaller areas. Additionally, if a large expansion plate is also designed to be used with dry dusting/sweeping sheets, those sheets can also be included as part of the kit with specific instructions for use.

As discussed more fully hereafter, another aspect of the present invention is directed to adapter plates (which in one of the embodiments can be considered to be a "scrubbing plate") which allow a dry or wet cleaning mop to be used for tough stain removal or scrubbing. While a scrubbing element can be incorporated into a pad or can be added to the mop as a scrubbing strap, those may not be sufficient to remove tough stains or stains which are hard to reach, such as for example in grout lines between ceramic tiles. In order to perform this kind of "heavy cleaning", any of the previously disclosed adapter plates 30 can further include a durable brush 40 or scrubby which is added to one or more of the edges of the adapter plate 30. Preferably, at least one brush 40 is located on one of the longitudinal edges of the scrubbing plate 30, most preferably on the leading edge of the scrubbing plate relative the forward motion of the mop during cleaning. This embodiment is schematically represented Fig. 23 through Fig. 27. In one embodiment, a scrubbing brush is attached to a hinge 140. This hinge 140 allows the scrub brush to be engaged when needed by flipping it downward as schematically represented in Fig. 26. When the brush is not needed, it can simply be disengaged by flipping it upward and resting on the top of the adapter plate, as schematically represented in Fig. 27.

In another embodiment of the invention represented Fig. 26 and 27, the scrubbing plate comprises at least one squeegee 50 located on one edge of the scrubbing plate 30. Preferably, the squeegee is located on a longitudinal edge of the scrubbing plate. In one embodiment, the

squeegee 50 is located on the leading edge of the scrubbing plate between the scrubbing brush and the longitudinal edge of the plate. In another embodiment, the squeegee is located on the trailing edge of the scrubbing plate. The squeegee is beneficial by helping to concentrate dirty liquid that is spread out into puddles which are easier for a pad to absorb. In fact, a scrubbing  
5 plate with a scrubbing brush 40 and a squeegee 50 has been shown to be beneficial as part of a floor restoration device when floors have a significant level of embedded and built-up dirt caused by aging and inadequate cleaning. With a floor restoration device, a heavy-duty liquid cleaner that penetrates deep into surfaces is applied to the floor which is then scrubbed thoroughly for several minutes. The excess liquid and loosened dirt is then collected with a squeegee 50 into a  
10 small puddle. The implement with the scrubbing plate 30 can then be used to attach an absorbent pad, and the pad pushed over the puddle to absorb the dirt solution. The floor restoration tool comprises an adapter plate 30 with a scrubbing element or brush 40 and a squeegee 50 combined all into one, such that the scrubbing plate can be removably secured with for example Velcro® hooks and loops to an implement which also has Velcro® hooks or loops on the bottom.  
15 Alternatively, the scrubbing plate can be secured with straps, belts, snaps and the like to implements which do not have Velcro®. Another solution is to provide Velcro® straps with the scrubbing plate system such that the consumer can attach those Velcro® strips to the bottom of their existing implement. The brush or scrubbing surface 40 at the bottom of the scrubbing plate 30 can be designed such that a pad can be attached and removed easily even when it gets wet  
20 during scrubbing.

As discussed more fully hereafter, another aspect of the present invention is directed to adapter plates (which in one of the embodiments can be considered to be a "wet cleaning plate"), which allow a dry cleaning mop to be used with standard mopping pads and a dry cleaning mop  
25 to be used with wider or longer dry dusting sheets.

As discussed previously, the cleaning efficiency is increased if dry cleaning of a surface is performed prior to the wet cleaning of this surface. There are several ways for a consumer to perform wet cleaning of a surface. One of them is to use a wet cleaning implement comprising a container in fluid communication with a fluid delivery mechanism and an absorbent pad attached  
30 to the mop head of the wet cleaning implement with Velcro® hooks and loops. These wet cleaning implements are generally more expensive than existing dry cleaning implements and, as a result, a consumer who already owns a dry cleaning implement may be reluctant to invest in a second implement for wet cleaning. The wet cleaning adapter plate allows a consumer to use her dry cleaning mop with absorbent pads designed for wet cleaning implements. In this

embodiment, a substantially rectangular adapter plate comprises Velcro® loops or hooks at its bottom surface and securing elements for removably securing the adapter plate to the mop head of a dry cleaning implement such as for example Velcro® straps or rubber bands attached to the adapter plate or such as a notch on the top surface of the adapter plate forming a hollow space  
5 and having a length and a width such that a mop head can be removably forced fit in the hollow space of the adapter plate. In this embodiment, a consumer can simply attach the adapter plate to her dry cleaning implement and then attach an absorbent pad having Velcro® hooks or loops to the bottom surface of the adapter plate and having corresponding Velcro® loops or hooks. In order to increase the cleaning efficiency, the bottom surface of the adapter plate may also have a  
10 topographical design such as one previously described. Once an absorbent pad is secured to the adapter plate, the consumer can use her dry cleaning mop/wet cleaning adapter plate/absorbent pad assembly for wet cleaning of a surface. This wet cleaning adapter plate can be sold in a wet cleaning kit comprising a wet cleaning adapter plate for a dry cleaning implement, at least one absorbent pad and/or a hand held sprayer for spraying a cleaning solution on a surface.  
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As discussed more fully hereafter, another aspect of the present invention is directed to adapter plates (which in one of the embodiments can be considered to be a “powered plate”) which allows a mop for dry or wet cleaning to be used for enhanced cleaning and/or floor  
20 restoration.

In order to facilitate cleaning, a powered plate which can be adapted and attached to existing dry or wet cleaning mops has been invented. In one embodiment of this invention, the powered plate comprises a housing having a top and a bottom surface. The top surface of the housing includes securing members capable of removably attaching the powered plate to the  
25 bottom of a mop head of an existing mop. The plate housing includes an electric motor, a voltage source for powering the electric motor, vibrating means coupled to the motor for providing an alternative linear motion to at least one brush, at least one brush located on one edge of the plate housing and coupled to the vibrating means and a switch positioned on the plate housing and having an ON and OFF position for completing an electrical circuit between the motor and the  
30 voltage source. In this embodiment of the invention, examples of securing means can be Velcro® hooks and loops, straps, belts, snaps, pressure clips, adhesive tape or any equivalent. In one embodiment, the voltage source is composed of rechargeable batteries connected by electric wires to a printed circuit board comprising a battery charger jack extending through the plate housing. Once the batteries are discharged, the user can connect the charger jack to a charger and



thus recharge the batteries. In another embodiment, the voltage source is composed of non-rechargeable batteries such as disposable batteries connected in series. Those disposable batteries can be made accessible by providing a removable cover located, for example, on the top of the plate housing such that the user will have an easy access to the batteries when they need to be replaced. The user can activate the brush very simply by putting the switch in the ON position and use the powered plate to scrub a surface as long as necessary and as long as the batteries can supply enough energy to the electric motor. The powered plate is deactivated by putting the switch in the OFF position. In another embodiment of the invention, the electric motor is coupled to a rotative means for providing a rotating motion to at least one brush. In one embodiment, the rotative brush is positioned in one edge of the powered plate, preferably a longitudinal edge (along the x dimension) of the powered plate. In this embodiment, the rotative brush has substantially a cylindrical shape and its rotational axis is substantially parallel to the x dimension. In yet another embodiment of the invention, the rotative brush is positioned at the bottom surface of the powered plate. In this embodiment, the rotative brush is substantially rounded in shape and its rotational axis is substantially perpendicular to the x-y plan (i.e. perpendicular to the surface to be cleaned). In one embodiment of the invention, the rounded brush is removably attachable to the bottom of a rotative plate coupled to the electric motor. In this embodiment, the rounded brush can be attached to the bottom of the rotative plate by Velcro® hooks or loops. This embodiment is particularly beneficial since it allows different kinds of pads to be attached to the rotative plate. For example, a rounded buffing pad may be attached to the rotative plate to allow polishing of the floor.

As discussed more fully hereafter, another aspect of the present invention is directed to adapter plates (which in one of the embodiments can be considered to be a "carpet plate") which allows a mop for wet cleaning or dry cleaning to be used for carpet cleaning.

In one embodiment of the invention, a carpet plate having at the bottom surface Velcro® hooks or loops is attached is removably attached to the mop head of a dry cleaning implement and an absorbent pad is removably attached using Velcro® hooks or loops to the bottom of the carpet adapter plate. The Velcro® hooks and loops offer a stronger attachment of the absorbent pad to the adapter plate but one skilled in the art will understand that other attachment structures may be used and offer the same benefits. In this embodiment, a consumer can spray a cleaning solution on the carpet with a liquid delivery system such as a hand held sprayer or an aerosol container and then sweep the implement on the carpet in order to remove and absorb dirt. In another embodiment of the invention, represented in Fig. 28, a scrubbing adapter plate 30 can be

used with a dry or wet cleaning implement and with an absorbent pad to remove dirt deeply located in the carpet pile and bring it up to the surface. In order to perform cleaning of a carpet, the user has to saturate the carpet with a cleaning solution and optionally but preferably use the brush on the carpet plate to loosen the dirt in the carpet. The absorbent pad is then wiped across the carpet to absorb the dirty solution. It has been discovered that typical brushes can easily get soiled when used for carpet cleaning and may lose part of its scrubbing ability. In one embodiment of the invention, the brush is replaced by a longitudinal scraping element 60 made of a substantially rigid material capable of penetrating into a carpet without damaging the fibers of the carpet. This embodiment is schematically represented in Fig. 28. In another embodiment, the scraping element comprises teeth 160, resembling a saw blade design, to penetrate further into the carpet. Typically, carpets are very much like a fabric and tend to have a high affinity for holding onto liquids. A longitudinal squeegee 50 can be added to the carpet plate to allow an easier removal of liquid in the carpet. The squeegee helps concentrating the liquid into puddles which are more easily absorbed by the absorbent pad.

In order to improve the liquid absorbing ability of the pad, the consumer can be instructed to press down firmly onto the pad for a few seconds, then release the pressure on the implement and thereafter repeat the operation. This succession of pressure being applied and pressure being released onto the pad creates a pumping action which is beneficial to draw liquid into the absorbent pad. Applicants have discovered that a carpet plate comprising elevational elements as described previously which create pressure zones on the pad, is also beneficial for liquid absorption when used for carpet cleaning.

As is discussed above, to enhance the versatility of a cleaning system that uses an implement and disposable absorbent pad for cleaning, a carpet cleaning concept can be advertised as an extension of this system. With the appropriate product design and instructions for use consumers can get carpets not only cleaned but refreshed quickly and easily without having to use a vacuum cleaner. Spots, spills, and accidents on carpets can also be more easily cleaned up because the consumer can do it standing up rather than having to get down on their hands and knees as they most often do. For refreshing and deodorizing, the consumer can be provided with a different liquid product and a thinner less absorbent pad whereby liquid is misted over the surface and then spread uniformly with the pad.

One skilled in the art will understand that each of the above described adapter plates can be part of a cleaning kit comprising the an adapter plate, at least one cleaning sheet or pad. A kit

comprising at least one cleaning pad can also comprise a liquid delivery system such as a hand held sprayer or an aerosol container for spraying a liquid onto a surface to be cleaned.

In one aspect, the present invention is used in combination with hard surface cleaning compositions, preferably for use with the cleaning pads and/or cleaning implements described herein, comprising:

- (a) optionally, from about 0.001% to about 0.5% by weight of the composition of surfactant, preferably selected from the group consisting of alkylpolysaccharides, alkyl ethoxylates, alkyl sulfonates, and mixtures thereof;
- 10 (b) optionally, hydrophilic polymer, preferably less than about 0.5% by weight of the composition;
- (c) optionally, organic solvent, preferably from about 0.25% to about 7% by weight of the composition and preferably having a boiling point of from about 120°C to about 180°C;
- 15 (d) optionally, from about 0.01% to about 1% by weight of the composition of mono- or polycarboxylic acid;
- (e) optionally, from about 0.01% to about 1% by weight of the composition of odor control agent, preferably cyclodextrin;
- (f) optionally, a source of peroxide, preferably from about 0.05% to about 5% by weight of the composition and preferably selected from the group consisting of benzoyl peroxide, hydrogen peroxide, and mixtures thereof;
- 20 (g) optionally, from about 0.001% to about 0.1% by weight of the composition of thickening polymer;
- (h) aqueous solvent system, preferably at least about 80% by weight of the composition;
- 25 (i) optionally, suds suppressor;
- (j) optionally, from about 0.005% to about 0.2% by weight of the composition of a perfume comprising:
  - (i) optionally, from about 0.05% to about 90% by weight of the perfume of volatile, hydrophilic perfume material;
  - 30 (ii) optionally, at least about 0.2% by weight of the perfume of volatile, hydrophobic perfume material;
  - (iii) optionally, less than about 10% by weight of the perfume of residual, hydrophilic perfume material;

(iv) less than about 10% by weight of the perfume of residual, hydrophobic perfume material;

(k) optionally, a detergent adjuvant, preferably selected from the group consisting of detergency builder, buffer, preservative, antibacterial agent, colorant, bleaching agents, chelants, enzymes, hydrotropes, corrosion inhibitors, and mixtures thereof.

In one embodiment, the present invention is used in combination with a cleaning pad, preferably disposable, for cleaning a hard surface, the cleaning pad comprising:

(a) at least one absorbent layer;

(b) optionally, a liquid pervious scrubbing layer; wherein the liquid pervious scrubbing layer is preferably an apertured formed film, more preferably a macroscopically expanded three-dimensional plastic web, having tapered or funnel-shaped apertures, meaning that the diameter at the lower end of the aperture is greater than the diameter at the upper end of the aperture, actually exhibits a suctioning effect as the cleaning pad is moved across the surface being cleaned, and/or surface aberrations and preferably comprising a hydrophobic material;

(c) optionally, an attachment layer, wherein the attachment layer preferably comprises a clear or translucent material, more preferably a clear or translucent polyethylene film, and wherein the attachment layer preferably comprises loop and/or hook material for attachment to a support head of a handle of a cleaning implement;

(d) optionally, multiple planar surfaces;

(e) optionally, at least one functional cuff, preferably at least one free-floating, looped functional cuff;

(f) optionally, a density gradient throughout at least one absorbent layer; wherein the density gradient preferably comprises a first absorbent layer having a density of from about 0.01 g/cm<sup>3</sup> to about 0.15 g/cm<sup>3</sup>, preferably from about 0.03 g/cm<sup>3</sup> to about 0.1 g/cm<sup>3</sup>, and more preferably from about 0.04 g/cm<sup>3</sup> to about 0.06 g/cm<sup>3</sup>, and a second absorbent layer having a density of from about 0.04 g/cm<sup>3</sup> to about 0.2 g/cm<sup>3</sup>, preferably from about 0.1 g/cm<sup>3</sup> to about 0.2 g/cm<sup>3</sup>, and more preferably from about 0.12 g/cm<sup>3</sup> to about 0.17 g/cm<sup>3</sup>; wherein the density of the first absorbent layer is about 0.04 g/cm<sup>3</sup>, preferably

about 0.07 g/cm<sup>3</sup>, and more preferably about 0.1 g/cm<sup>3</sup>, less than the density of the second absorbent layer;

- (g) optionally, at least one adhesive scrubbing strap, preferably comprising a material selected from the group consisting of nylon, polyester, polypropylene, abrasive material, and mixtures thereof; and
- (h) optionally, perfume carrier complex, preferably selected from the group consisting of cyclodextrin inclusion complex, matrix perfume microcapsules, and mixtures thereof; wherein the perfume carrier complex is preferably located in an absorbent layer.

In one aspect of the invention, the adapter plate and cleaning implement are used in combination with a cleaning pad comprising at least two absorbent layers, wherein the absorbent layers have multiple widths in the z-dimension and comprises functional cuffs, preferably free-floating, double-layer loop functional cuffs. Preferably, the cleaning pad has a t<sub>1200</sub> absorbent capacity of at least about 5 grams/gram.

In another aspect, the adapter plate and cleaning implement are used in combination with a dry cleaning sheet, preferably disposable, for cleaning hard surfaces, the cleaning sheet optionally comprising functional cuffs, preferably free-floating, double-layer loop functional cuffs. Preferred sheets which are suitable for use with the present invention are more fully described in US patent application serial nos. 09/082,349 entitled "Novel Structures Useful As Cleaning Sheets", filed May 20, 1998; and 09/082,396 entitled "Novel Three Dimensional Structures Useful As Cleaning Sheets", filed May 20, 1998, both of which are hereby incorporated herein by reference. The sheets described in these applications preferably comprise two components: a polymeric net or scrim and a fibrous material which is laid upon the scrim, by lamination via heat or chemical means such as adhesives or by hydrogentanglement. Scrim materials useful herein are described in detail in U.S. Patent No. 4,636,419, which is incorporated by reference herein. The scrims may be formed directly at the extrusion die or can be derived from extruded films by fibrillation or by embossment, followed by stretching and splitting. The scrim may be derived from a polyolefin such as polyethylene or polypropylene, copolymers thereof, poly(butylene terephthalate), polyethylene terephthalate, nylon 6, nylon 66, and the like. Scrim materials are available from various commercial sources. A preferred scrim material useful in the present invention is a polypropylene scrim, available from Conwed Plastics of Minneapolis, MN.

The sheets also preferably have a continuous high and discrete low basis weight regions, respectively, and/or a three-dimensional surface, both features being more fully described in US

patent application serial nos. 09/082,349 and 09/082,396. While the low basis weight regions are depicted as being of essentially the same size and of a single well defined shape, these regions may be of differing sizes to facilitate entrapment of particles of varying size and shape. The high and low basis weight regions and the three dimensionality of the surface of the sheet assist in receiving and trapping material, such as dust and dirt, in the sheet.

The sheets can be made using either a woven or nonwoven process, or by forming operations using melted materials laid down on forms, especially in belts, and/or by forming operations involving mechanical actions/modifications carried out on films. The structures are made by any number of methods (e.g., spunbonded, meltblown, resin bonded, air-through bonded, etc.), once the essential three dimensional and basis weight requirements are known. However, the preferred structures are nonwoven, and are especially those formed by hydroentanglement as is well known in the art, since they provide highly desirable open structures. Also preferred are heat-bonded nonwoven structures which utilize continuous filaments bonded to a base sheet via heat-sealed lines.

Materials particularly suitable for forming the fibrous material of the sheet include, for example, natural cellulose as well as synthetics such as polyolefins (e.g., polyethylene and polypropylene), polyesters, polyamides, synthetic cellulose (e.g., RAYON®), and blends thereof. Also useful are natural fibers, such as cotton or blends thereof and those derived from various cellulosic sources. Preferred starting materials for making the hydroentangled fibrous sheets of the present invention are synthetic materials, which may be in the form of carded, spunbonded, meltblown, airlaid, or other structures. Particularly preferred are polyesters, especially carded polyester fibers. The degree of hydrophobicity or hydrophilicity of the fibers is optimized depending upon the desired goal of the sheet, either in terms of type of soil to be removed, the type of additive that is provided, when an additive is present, biodegradability, availability, and combinations of such considerations. In general, the more biodegradable materials are hydrophilic, but the more effective materials tend to be hydrophobic.

During the effort to develop the present cleaning pads and sheets, Applicants discovered that an important aspect of cleaning performance is related to the ability to provide a cleaning pad having apertured formed films, a liquid impervious attachment layer, and/or density gradients, and/or functional cuffs and a cleaning sheet having functional cuffs. In the context of a typical cleaning operation (i.e., where the cleaning pad and/or sheet is moved back and forth in a direction substantially parallel to the pad's or sheet's y-dimension or width), each of these structural elements provide the cleaning pads and/or sheets improved cleaning performance, both

separately and in combination with one or more additional elements. Apertured formed films, preferably utilized in the scrubbing layer, are pervious to liquids and provide efficient transfer of liquid from the surface being cleaned to other layers of the cleaning pad, preferably one or more absorbent layers, while reducing the tendency for such liquid to be squeezed back onto the surface being cleaned. Functional cuffs are preferably free-floating so as to "flip" back and forth in the y-dimension during a typical cleaning operation, thus trapping particulate matter and reducing the tendency for such particulate matter to be redeposited on the surface being cleaned. Density gradients are preferably incorporated in the absorbent layer(s) of the cleaning pad to "pump" or "wick" liquid away from the surface being cleaned to areas in the cleaning pad furthest away from the surface being cleaned. The liquid impervious attachment layer provides a barrier which helps to better distribute the liquid in the x-y direction after liquid reaches the back of the pad which is further set away from the cleaning surface. These aspects of the present invention, and the benefits provided, are discussed in detail with reference to the drawings.

The skilled artisan will recognize that various materials can be utilized to carry out the claimed invention. Thus, while preferred materials are described below for the various adapter plates, cleaning implement, pad, and sheet components, it is recognized that the scope of the invention is not limited to such descriptions.

It has been found that incorporating a density gradient throughout the absorbent layer(s) of the cleaning pad used in combination with the adapter plates of the present invention has an important effect on cleaning performance and ability of the cleaning pad to quickly absorb liquids, especially liquid containing particulate matter. Although density gradients have been used in absorbent articles such as diapers, sanitary napkins, incontinence devices, and the like, Applicants have discovered specific density gradients optimally useful for the absorbent layer in cleaning pads. Density gradients in cleaning pads are unique for at least two identifiable reasons. First, the absorbent layer in a cleaning pad needs to handle liquid with both dissolved components and undissolved, suspended components, such as insoluble particulate matter. In the case of diapers, sanitary napkins, incontinence devices, and the like, the absorbent layer typically needs to handle only liquids with dissolved components, such as bodily fluids. Second, the absorbent layer of a cleaning pad needs to absorb liquid against the force of gravity. In terms of diapers, sanitary napkins, incontinence devices, and the like, the absorbent layer typically has the force of gravity to pull liquid into, and distribute it throughout, the absorbent layer. Having sufficient resiliency in the cleaning pad is important, as described below, in maintaining good cleaning performance, especially in cleaning pads comprising a density gradient. The preferred cleaning pads comprising

the specific density gradients described herein exhibit improvements in at least three important characteristics affecting hard surface cleaning performance: acquisition (the time required to transfer liquid from the surface being cleaned to the absorbent layer(s) of the cleaning pad), distribution (the liquid wicking ability of the absorbent layer(s) so as to utilize as much of the pad as possible), and rewet (the amount of dirty liquid retained within the absorbent layer(s) and not squeezed out during a cleaning process).

The absorbent layer can comprise a single absorbent layer with a continuous density gradient in the cleaning pad's z-dimension, or multiple absorbent layers having different densities resulting in a density gradient. A continuous density gradient is one in which the material comprising the cleaning pad is homogeneous, but has differing densities throughout the material. A process for creating a continuous density gradient is disclosed in U.S. Patent No. 4,818,315, issued April 4, 1989 to Hellgren, et al., which is hereby incorporated by reference. The density of the dry web used to form the layers of the pad can be measured after evaporating the liquid from the premoistened wipe. The density is the basis weight of the dry web divided by the thickness of the dry web, measured in consistent units, and the thickness of the dry web is measured using a circular load foot having an area of about 2 square inches and which provides a confining pressure of about 95 grams per square inch. Preferably, the cleaning pad used in combination with the present invention comprises a density gradient resulting from multiple absorbent layers, preferably three, each having a different density. A density gradient is typically "strong" when the density of the absorbent layers increase from a lower absorbent layer to an upper absorbent layer. Preferably, the present cleaning pads comprise a "strong" density gradient, which provides fast acquisition, better core utilization by effectively wicking liquid in the z- and x-y directions, and a reduced tendency for allowing absorbed liquids, especially those containing undissolved particulate, to be squeezed out. A strong density gradient preferably comprises at least two absorbent layers, with a first absorbent layer having a density of from about 0.01 g/cm<sup>3</sup> to about 0.15 g/cm<sup>3</sup>, preferably from about 0.03 g/cm<sup>3</sup> to about 0.1 g/cm<sup>3</sup>, and more preferably from about 0.04 g/cm<sup>3</sup> to about 0.06 g/cm<sup>3</sup>, and a second absorbent layer having a density of from about 0.04 g/cm<sup>3</sup> to about 0.2 g/cm<sup>3</sup>, preferably from about 0.1 g/cm<sup>3</sup> to about 0.2 g/cm<sup>3</sup>, and more preferably from about 0.12 g/cm<sup>3</sup> to about 0.17 g/cm<sup>3</sup>; wherein the density of the first absorbent layer is about 0.04 g/cm<sup>3</sup>, preferably about 0.07 g/cm<sup>3</sup>, and more preferably about 0.1 g/cm<sup>3</sup>, less than the density of the second absorbent layer.

In another embodiment, the present cleaning pad comprises a density gradient resulting from three absorbent layers, wherein a first absorbent layer has a density of from about 0.01 g/cm<sup>3</sup> to about 0.08 g/cm<sup>3</sup>, preferably from about 0.03 g/cm<sup>3</sup> to about 0.06 g/cm<sup>3</sup>, and a second



absorbent layer has a density of from about 0.03 g/cm<sup>3</sup> to about 0.12 g/cm<sup>3</sup>, preferably from about 0.07 g/cm<sup>3</sup> to about 0.1 g/cm<sup>3</sup>, and a third absorbent layer has a density of from about 0.05 g/cm<sup>3</sup> to about 0.2 g/cm<sup>3</sup>, preferably from about 0.08 g/cm<sup>3</sup> to about 0.15 g/cm<sup>3</sup>; wherein the difference in density between the first absorbent layer and the second absorbent layer, and between the  
5 second absorbent layer and the third absorbent layer, is at least about 0.02 g/cm<sup>3</sup>, preferably at least about 0.04 g/cm<sup>3</sup>.

In yet another embodiment, the cleaning pad comprises a first absorbent layer having a density of about 0.05 g/cm<sup>3</sup>, a second absorbent layer having a density of about 0.1 g/cm<sup>3</sup>, and a third absorbent layer having a density of about 0.15 g/cm<sup>3</sup>. It is recognized that a such a density  
10 gradient can be present in a cleaning pad with or without layers having multiple widths in the z-dimension.

As a result of the density gradient, the porosity (meaning the ratio of the volume of interstices of a material to the total volume) of the absorbent layer will typically decrease as the density increases. The porosity is important, particularly in the context of a cleaning pad for  
15 cleaning hard surfaces, because the liquid to be absorbed by the cleaning pad typically contains moderate amounts of relatively large particulate matter. As the soiled liquid enters the cleaning pad through the scrubbing layer, the larger particulate matter becomes entrapped in the interstices of the lower absorbent layers. As the porosity of the absorbent layers decreases, and the density increases, the larger particulate matter becomes trapped in the larger interstices of the lower  
20 absorbent layers and the remaining liquid is then transferred to the upper absorbent layers. This allows the liquid to be more easily transferred towards the higher-density layers and allows the particulate matter to remain trapped in the interstices of the lower absorbent layers. As a result, the cleaning pad retains both liquid and particulate matter much more effectively than cleaning pads without a strong density gradient.

Where an absorbent layer has a density of less than about 0.1 g/cm<sup>3</sup>, the layer tends to be less resilient, which is another important property of the present cleaning pad as discussed below. In order to increase the resiliency of an absorbent layer having a relatively low density, a thermoplastic material, preferably a bicomponent fiber, is combined with the fibers of the absorbent layer. Upon melting, at least a portion of this thermoplastic material migrates to the  
30 intersections of the fibers, typically due to interfiber capillary gradients. These intersections become bond sites for the thermoplastic material. When cooled, the thermoplastic materials at these intersections solidify to form the bond sites that hold the matrix or web of fibers together in each of the respective layers. This can be beneficial in providing additional overall integrity to the cleaning pad. While bicomponent fibers are known in the art, they are typically used at levels

of less than about 15%. It has been found that in order to provide desired resiliency, an absorbent layer having a density of less than about 0.05 g/cm<sup>3</sup> preferably comprises at least about 20%, preferably at least about 30%, more preferably at least about 40%, of a thermoplastic material such as a bicomponent fiber. A preferable bicomponent fiber comprises a copolyolefin bicomponent fiber comprising less than about 81% polyethylene terephthalate core and less than about 51% copolyolefin sheath and is commercially available from the Hoechst Celanese Corporation under the tradename CELBOND® T-255.

The foregoing description of the preferred embodiments of the invention have been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Modifications or variations are possible and contemplated in light of the above teachings by those skilled in the art, and the embodiments discussed were chosen and described in order to best illustrate the principles of the invention and its practical application. It is intended that the scope of the invention be defined by the claims appended hereto.

## WHAT IS CLAIMED IS:

1. A cleaning implement comprising a handle pivotably connected to a mop head characterized in that said mop head comprises securing members capable of removably attaching an adapter plate, said cleaning implement further comprising an adapter plate having a top and a bottom surface, a leading and a trailing edge, said adapter plate comprising at least one securing element capable of removably securing a cleaning pad or a cleaning sheet to said adapter plate, and wherein said adapter plate is removably attached to said mop head.
2. The cleaning implement of claim 1 wherein said cleaning implement further comprises a fluid container in fluid communication with a nozzle located on said mop head.
3. An adapter plate for a cleaning implement having a handle and a mop head, characterized in that said adapter plate comprises:

a plate having a top and a bottom surface, said plate comprising at least one securing element capable of removably securing a cleaning pad or a cleaning sheet to said plate, and wherein said plate comprises securing members capable of removably attaching said plate to said mop head of a cleaning implement.
4. The cleaning implement or adapter plate according to claim 1 or claim 3 wherein said securing members are male fasteners located at the bottom of said mop head and female fasteners located on the top surface of said adapter plate.
5. The cleaning implement or adapter plate of claim 4 further comprising a cleaning pad having a top and a bottom surface.
6. The cleaning implement or adapter plate of claim 5 wherein said at least one securing element comprises male fasteners located on the bottom surface of said adapter plate and female fasteners located on the top surface of said cleaning pad.
7. The cleaning implement or adapter plate according to claim 1 or claim 3 wherein said adapter plate is at least 50% longer but less than 150% longer than said mop head and wherein said adapter plate is up to 50% wider than said mop head.

8. The cleaning implement or adapter plate of claim 6 wherein the bottom surface of said adapter plate comprises discontinuities for generating pressure zones about the extremities of said pad during a forward and backward wiping motion of said cleaning implement on a surface to be cleaned.

9. The cleaning implement or adapter plate of claim 8 wherein said discontinuities are created by at least a first and a second elevational element, said first elevational element is located about one extremity of said adapter plate relative its length and said second elevational element is located about the opposite extremity of said adapter plate such that a hollow space is defined between said first and second elevational elements and a centered portion of the bottom surface of said adapter plate.

10. The cleaning implement or adapter plate of claim 9 wherein said adapter plate is flexible such that when pressure is applied to said centered portion of said adapter plate, said centered portion at least partially collapses and fills at least partially said hollow space.

11. The cleaning implement or adapter plate of claim 10 wherein said adapter plate comprises a substantially centered elevational element relative to the width of said adapter plate at the bottom surface of said plate and extending at least partially along the length of said plate and wherein said centered elevational element generates a pressure zone about the centered portion of said pad during a forward and backward wiping motion of said cleaning implement.

12. The cleaning implement or adapter plate of claim 4 further comprising a cleaning sheet.

13. The cleaning implement or adapter plate of claim 12 wherein said at least one securing element comprises an attachment structure located on the top surface of said adapter plate wherein said attachment structure is made of a flexible material and further comprises a base triangle having an apex and a plurality of substantially pie-shaped sections whose apexes meet at a substantially common point adjacent said base triangle and whose apexes are distinct from said base triangle's apex, wherein two sides of each of said base triangle and said pie-shaped sections are defined by slits passing through said flexible material such that each of said base triangle and

said pie-shaped sections can be deflected to receive the sheet and wherein each of said slits terminates at one end with a substantially circular opening.

14. The cleaning implement or adapter plate of claim 12 wherein said adapter plate further comprises at least one side panel extending from one edge of said adapter plate, said side panel being angled relative said adapter plate.

15. The cleaning implement or adapter plate of claim 14 wherein said adapter plate comprises a first and a second side panel, said first side panel extends from said leading edge and said second side panel extends from said trailing edge, and four attachment structures wherein each attachment structure is respectively positioned about each corners of said first and second side panels.

16. A method of dry cleaning a surface with a cleaning implement comprising a handle pivotably connected to a mop head, said mop head comprising securing members capable of removably securing an adapter plate, characterized in that said method comprises the steps of:

- providing an adapter plate having a top and a bottom surface, a leading and a trailing edge, said adapter plate comprising at least one securing element capable of removably securing a cleaning sheet to said adapter plate;
- securing a sheet to said adapter plate;
- securing said adapter plate to said cleaning implement; and
- mopping said surface with said cleaning implement.

17. A method of wet cleaning a surface with a cleaning implement comprising a handle pivotably connected to a mop head, said mop head comprising securing members capable of removably securing an adapter plate, characterized in that said method comprises the steps of:

- providing an adapter plate having a top and a bottom surface, a leading and a trailing edge, said adapter plate comprising at least one securing element capable of removably securing a cleaning sheet to said adapter plate;
- securing a cleaning pad to said adapter plate;
- securing said adapter plate to said cleaning implement;
- contacting said surface with a cleaning solution; and
- mopping said surface with said cleaning implement.

18. A cleaning kit for use with a dry cleaning implement characterized in that said kit comprises:

an adapter plate having a top and a bottom surface, a leading and a trailing edge, said adapter plate comprising at least one securing element capable of removably securing a cleaning pad to said adapter plate and a securing member for removably securing said adapter plate to a dry cleaning implement; and

at least one cleaning pad.

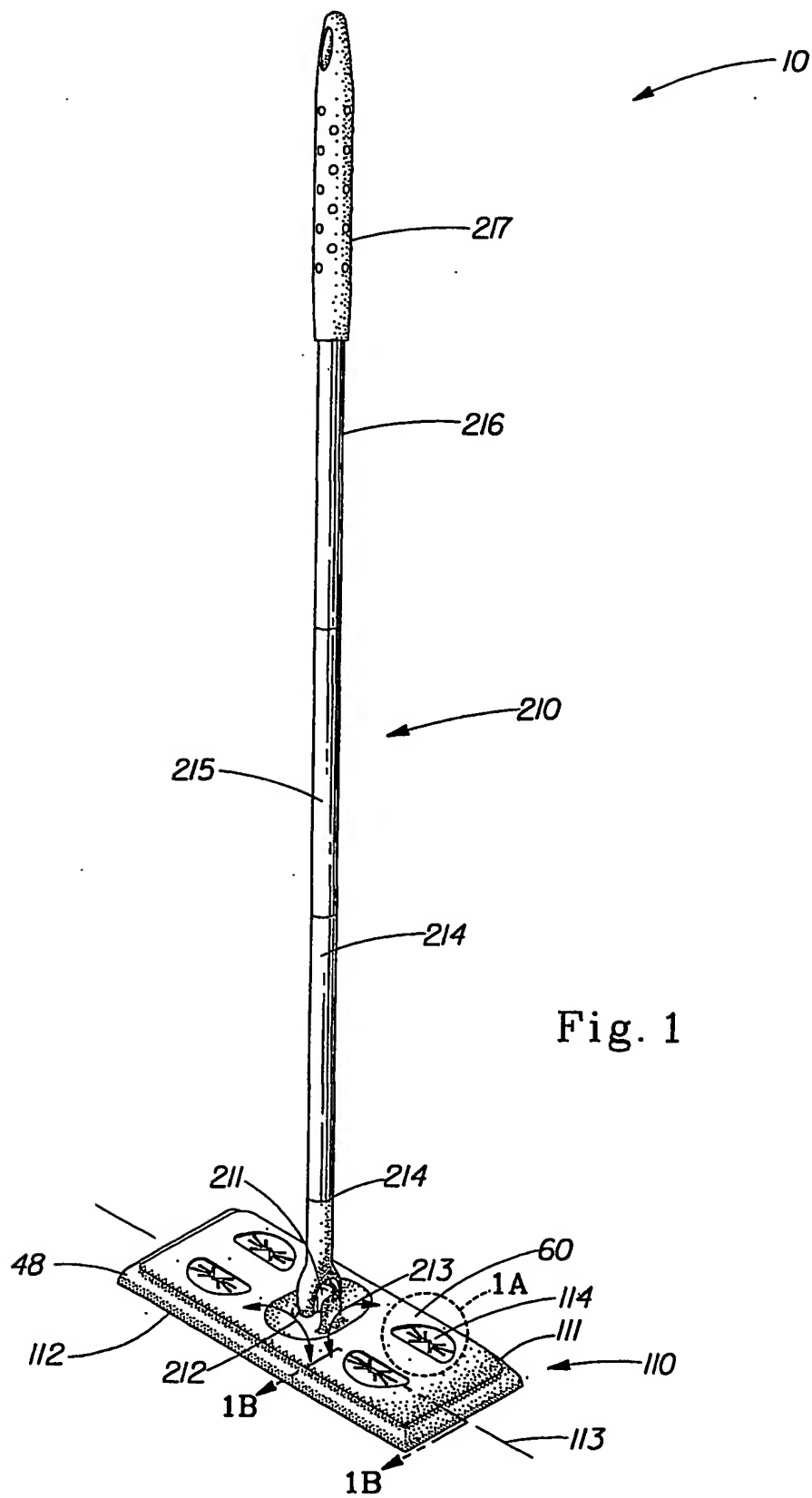
19. The cleaning kit of claim 18 further comprising a hand held sprayer.

20. A cleaning kit for use with a wet cleaning implement, characterized in that said kit comprises:

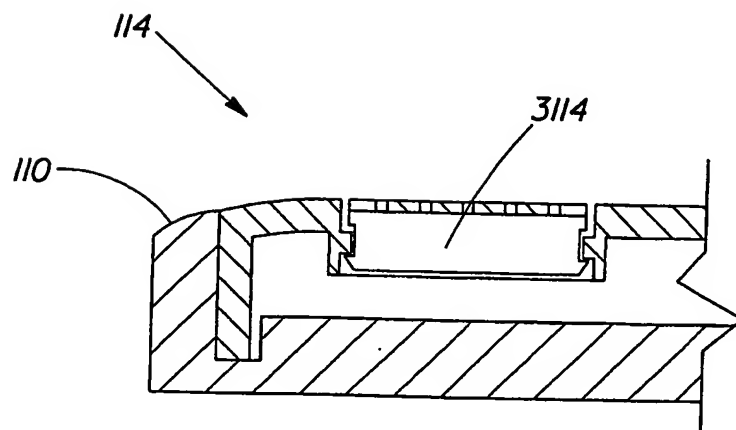
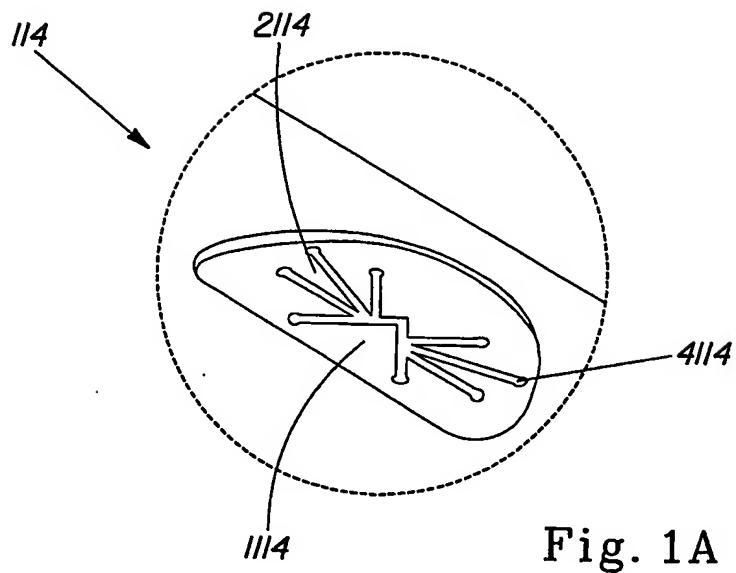
an adapter plate having a top and a bottom surface, a leading and a trailing edge, said adapter plate comprising at least one securing element capable of removably securing a cleaning sheet to said adapter plate and a securing member for removably securing said adapter plate to a wet cleaning implement; and

at least one cleaning sheet.

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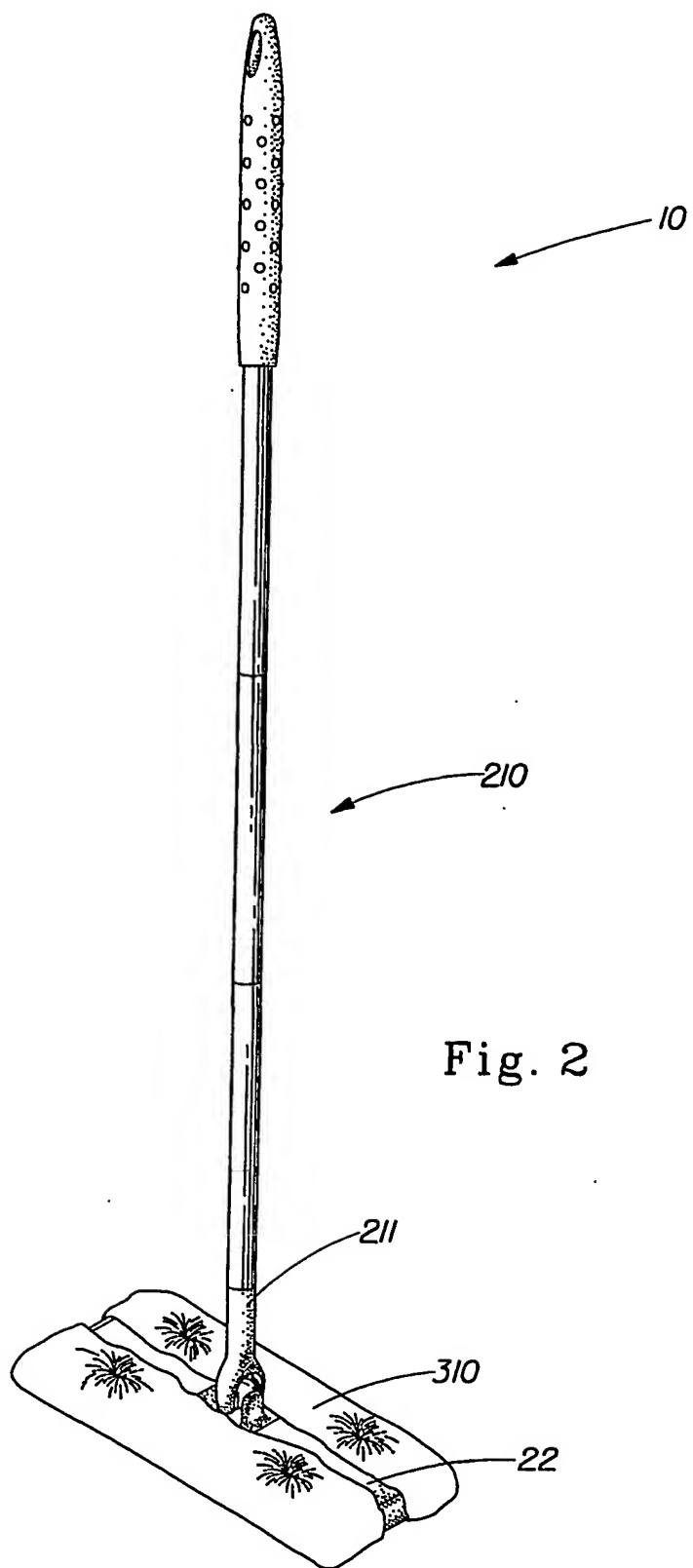


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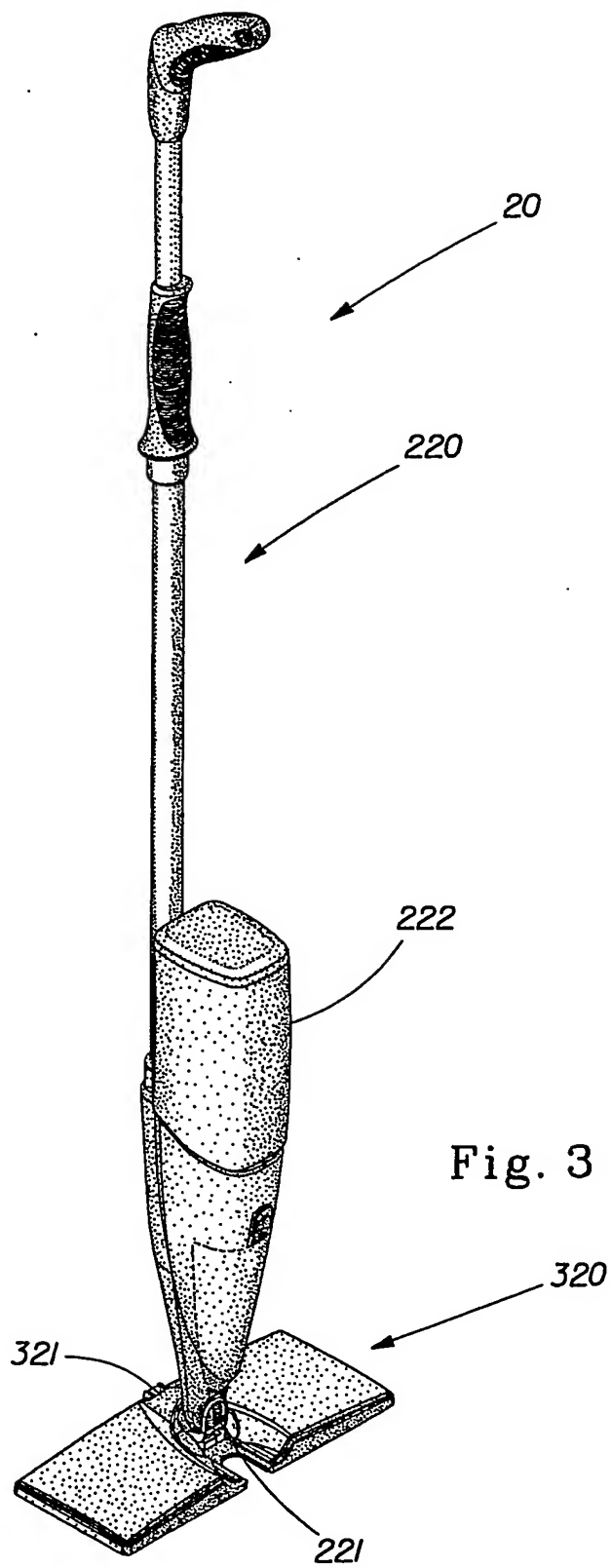




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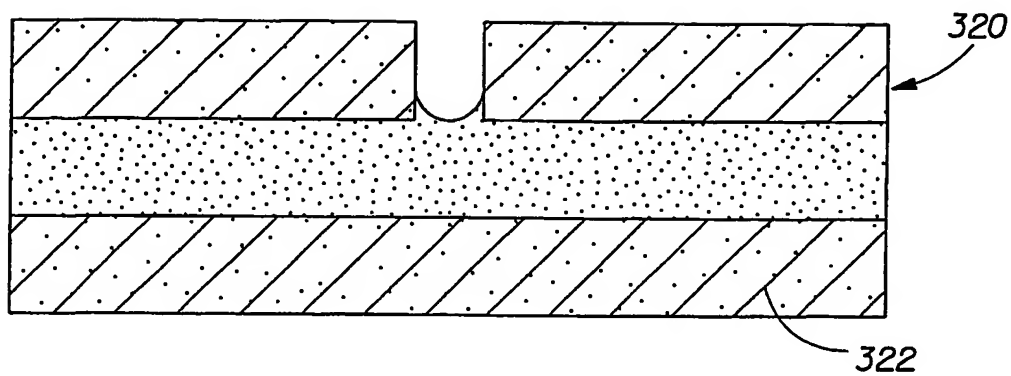


Fig. 3A

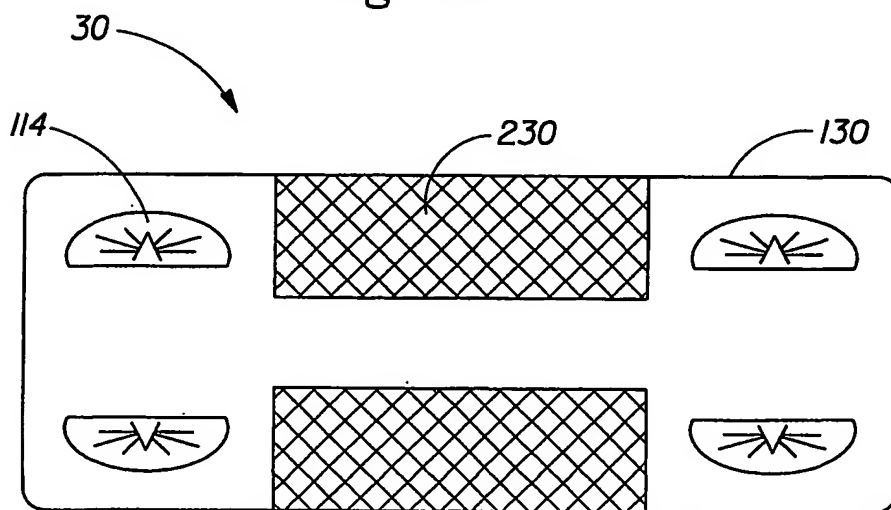


Fig. 4

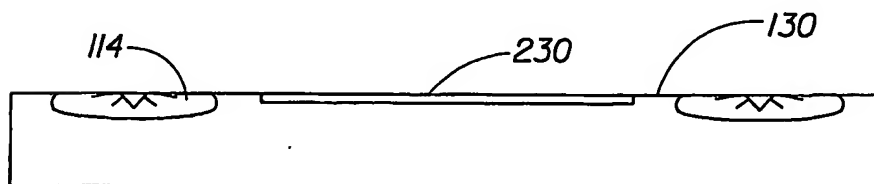


Fig. 5

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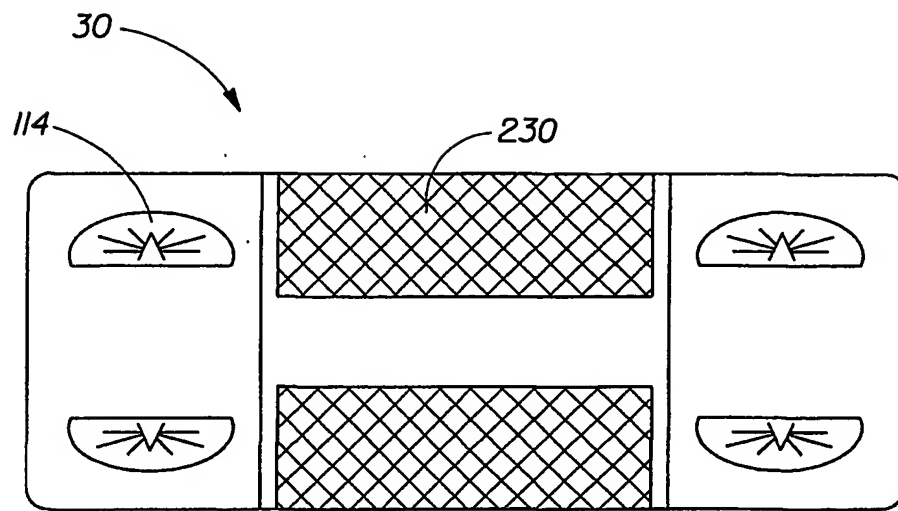


Fig. 6

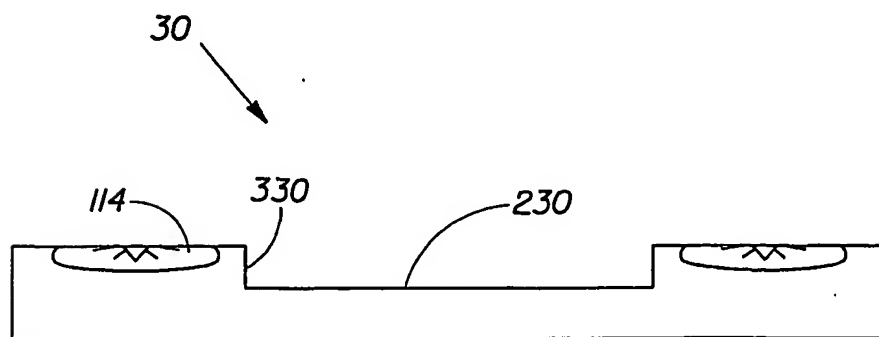


Fig. 7

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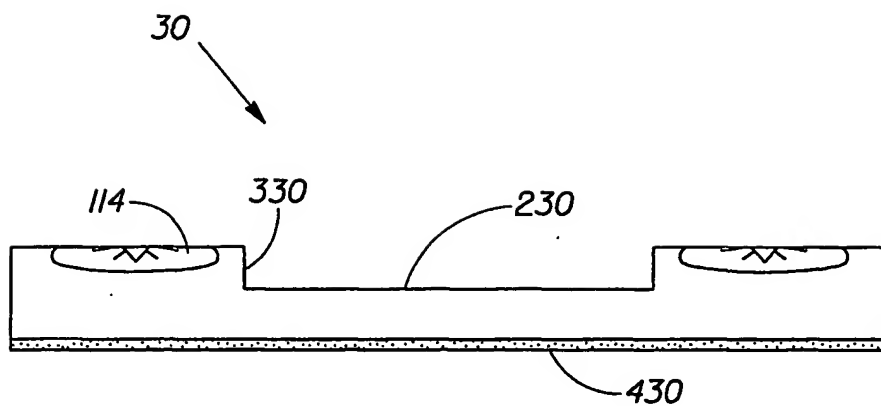


Fig. 8

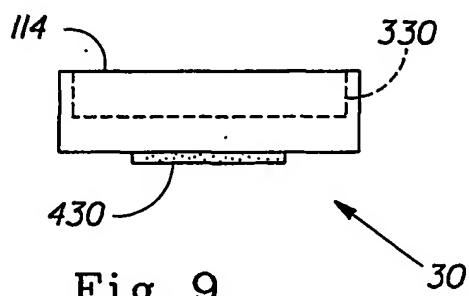


Fig. 9

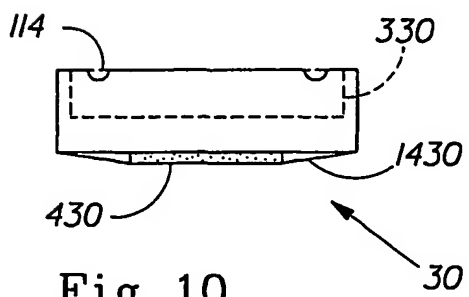


Fig. 10

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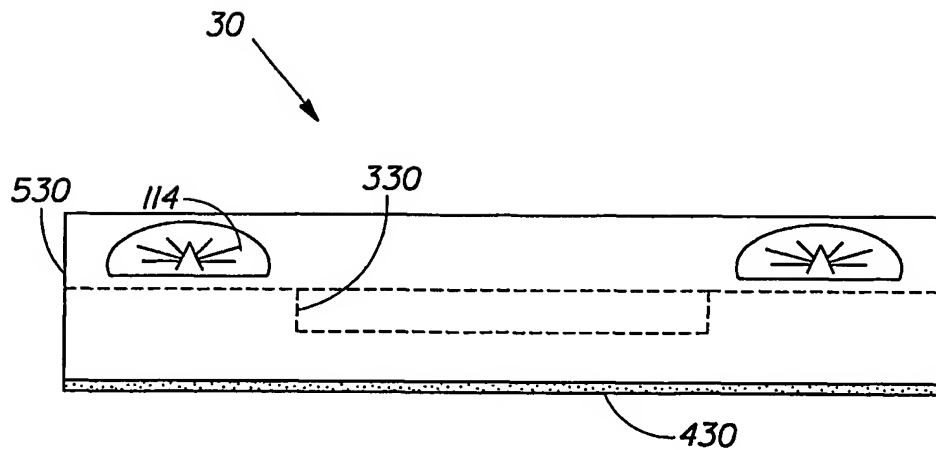


Fig. 11

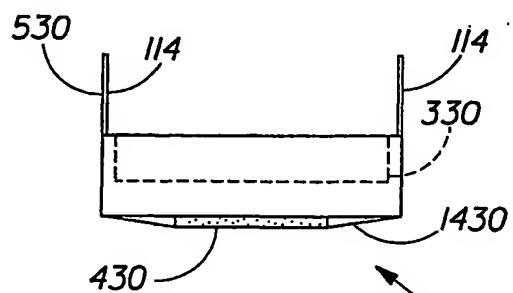


Fig. 12

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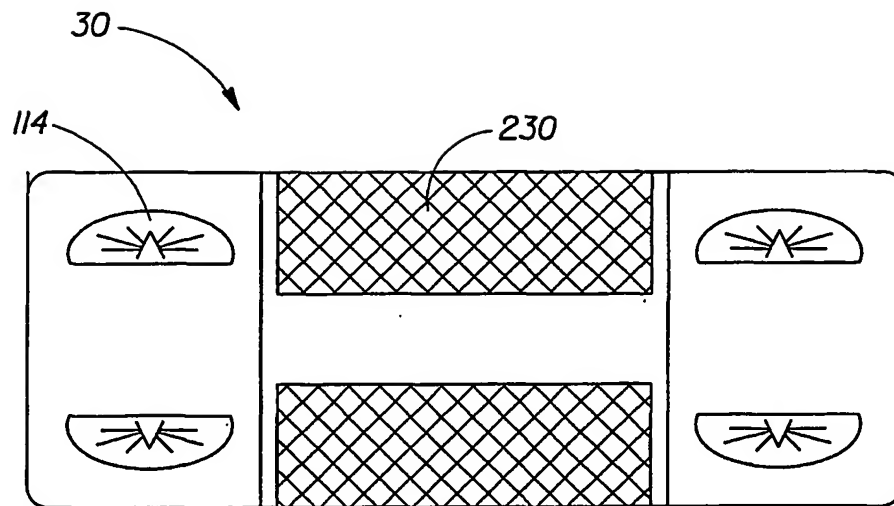


Fig. 13

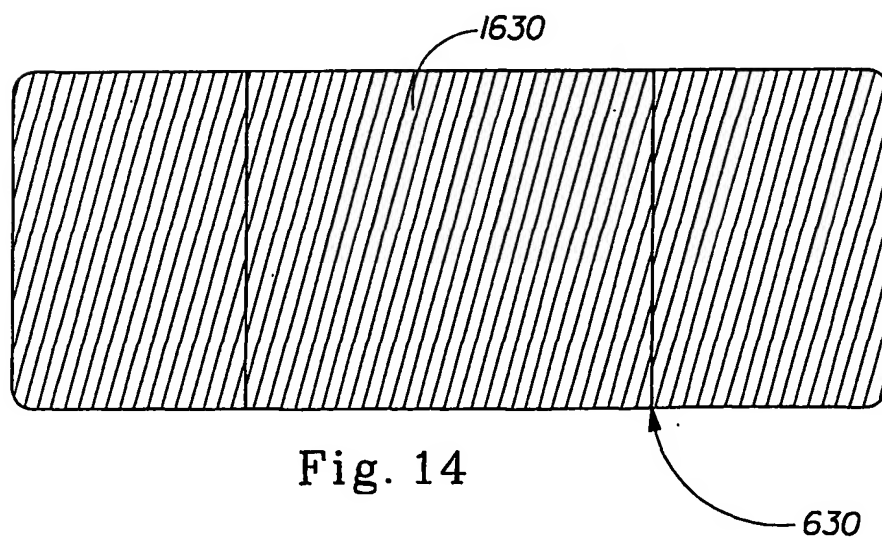


Fig. 14

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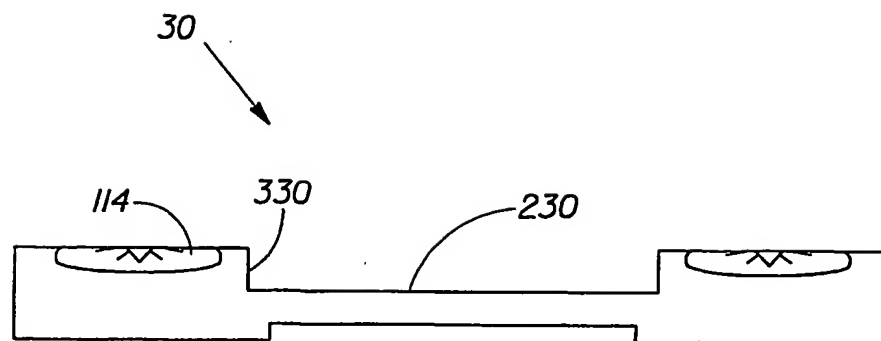


Fig. 15

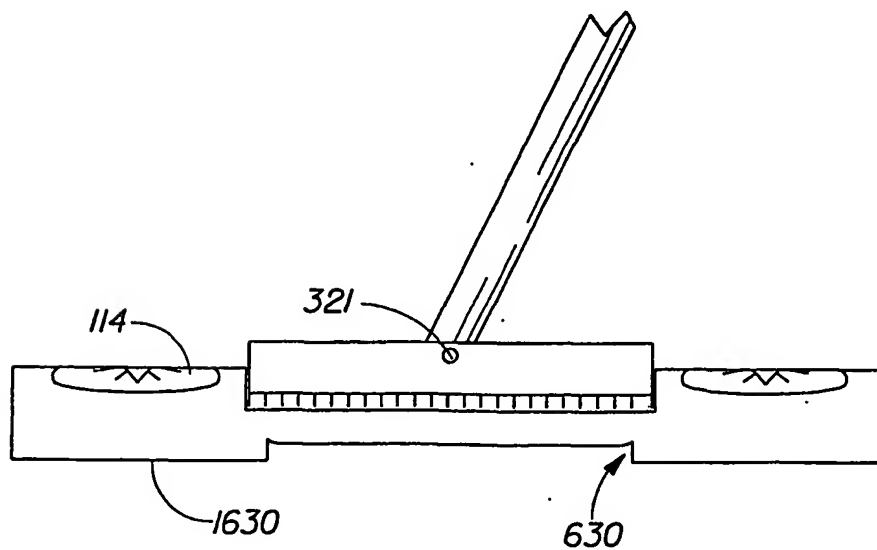


Fig. 16



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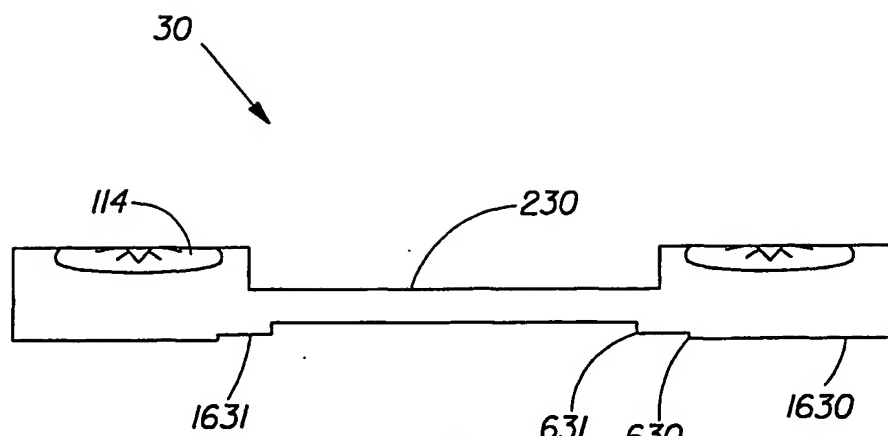


Fig. 17

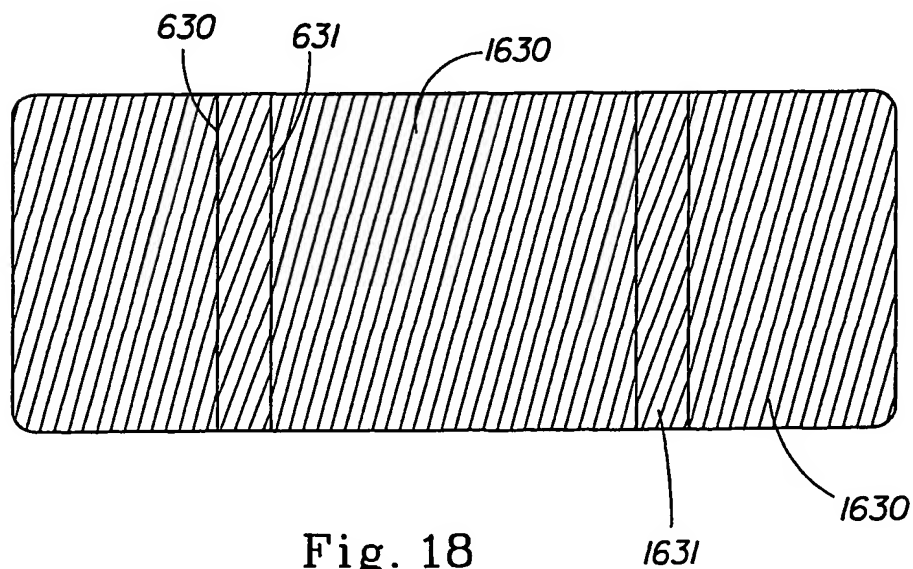


Fig. 18

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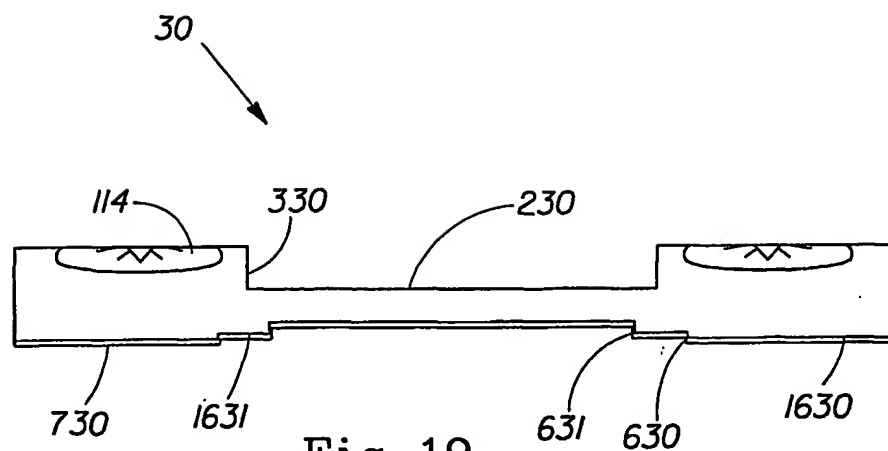


Fig. 19

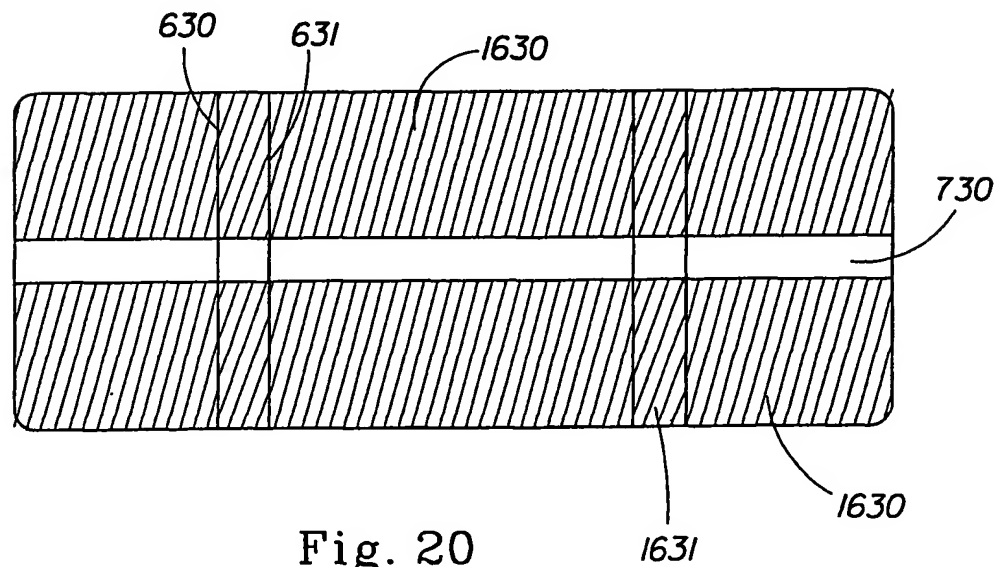


Fig. 20

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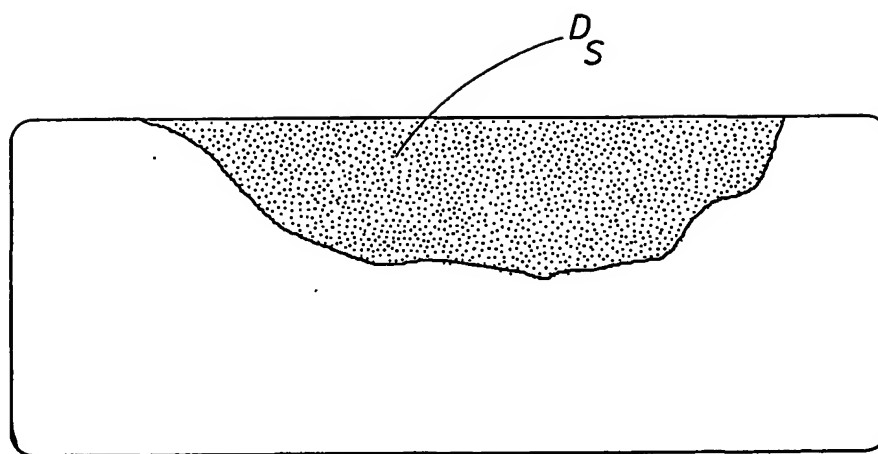


Fig. 21

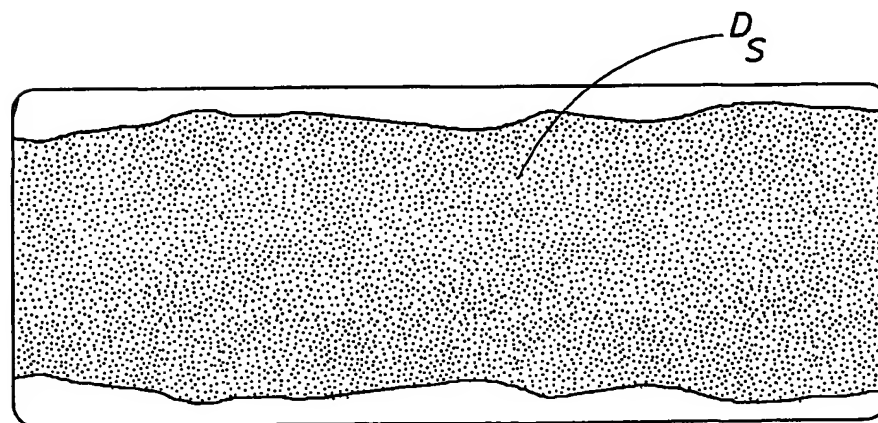
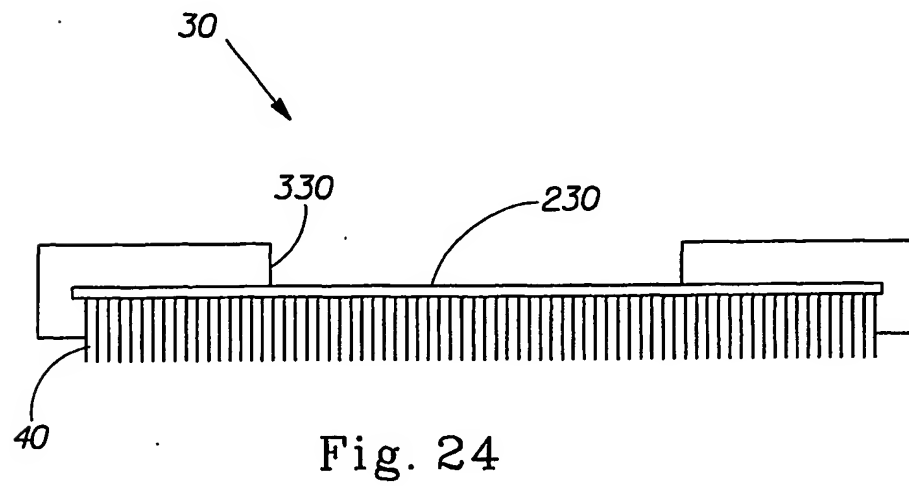
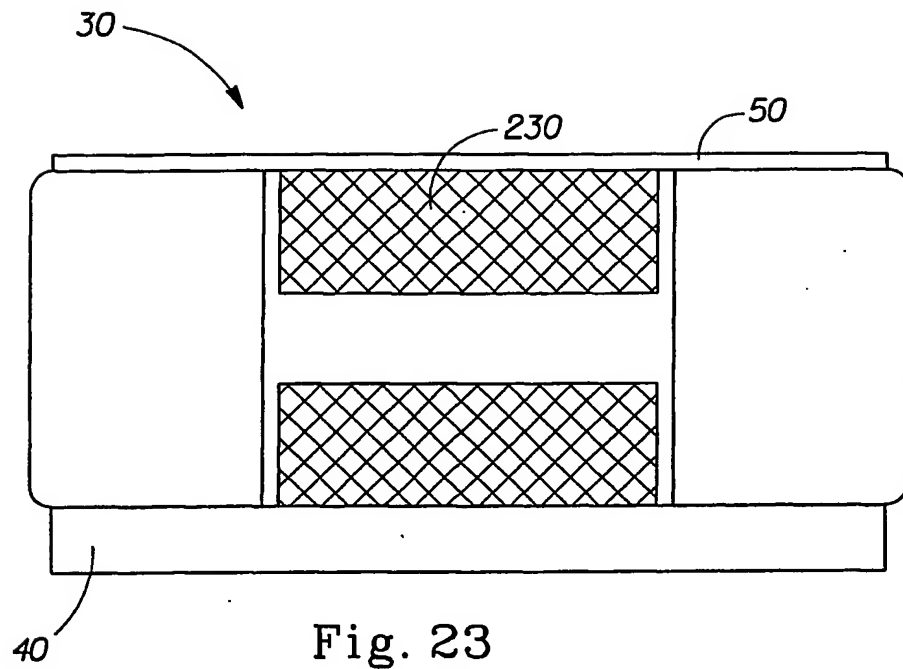


Fig. 22

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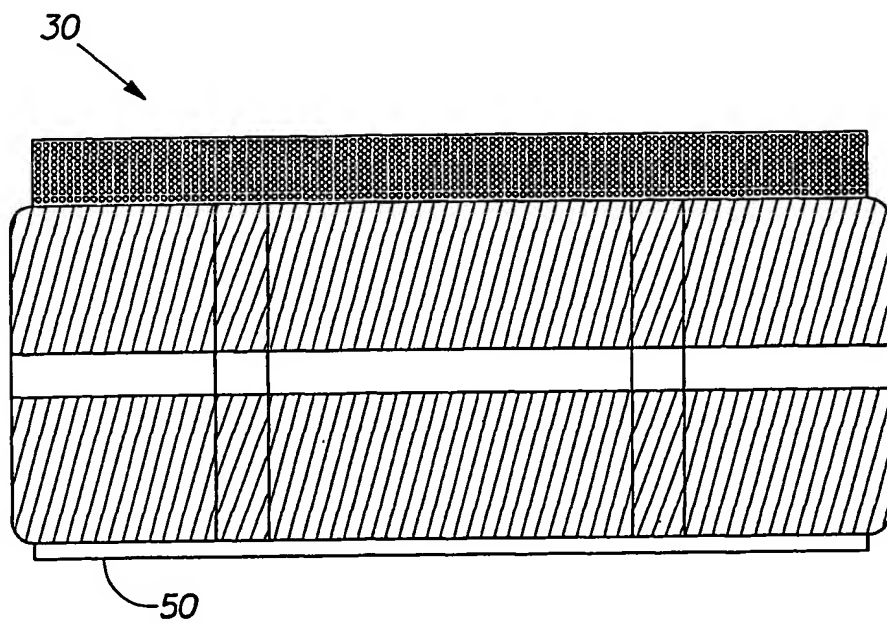


Fig. 25

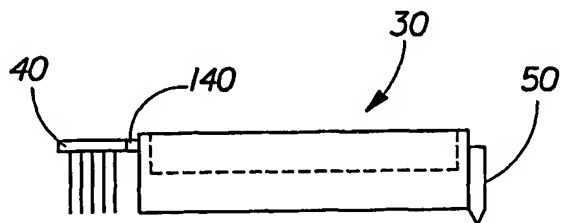


Fig. 26

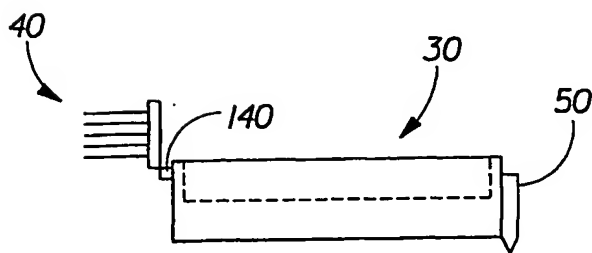


Fig. 27

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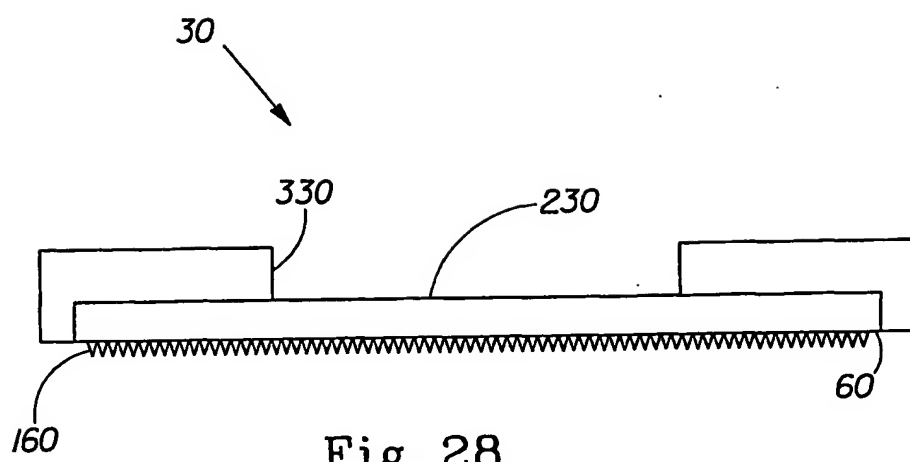


Fig. 28

# INTERNATIONAL SEARCH REPORT

International Application No.  
PCT/US 01/44469

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 7 A47L13/254 A47L13/24		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC 7 A47L		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 061 864 A (ENSSON LARS JOHNNY) 16 May 2000 (2000-05-16) column 2, line 57 - line 63 column 4, line 14 - line 23; figures 1-6,8	1,3-12, 14,16,18
Y	—	13,19
Y	WO 00 27271 A (JACKSON RHONDA JEAN ;POLICICCHIO NICOLA JOHN (US); RHAMY PRESTON J) 18 May 2000 (2000-05-18) page 92, line 11 -page 94, line 17; figures 5,7,8	13,19
X	US 5 888 006 A (SCHENNUM STEVEN M ET AL) 30 March 1999 (1999-03-30) column 2, line 34 - line 37; figures 1,3A — -/-	1,2,17, 18,20
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 18 April 2002		Date of mailing of the international search report 07/05/2002
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3018		Authorized officer Papadimitriou, S

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/44469

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 200 03 773 U (SCHMITT EDMUND HEINRICH) 18 May 2000 (2000-05-18) page 5, line 1 - line 6 -----	1,3,13
A	US 3 877 103 A (NASH LAWRENCE M) 15 April 1975 (1975-04-15) figures 1,2 -----	1,13
A	US 4 766 632 A (MURRAY JOHN H) 30 August 1988 (1988-08-30) column 1, line 7 - line 11 column 1, line 22 - line 33 -----	



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/44469

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6061864	A	16-05-2000	SE 506927 C2 AU 719806 B2 AU 7715696 A CA 2238091 A1 EP 0865253 A1 JP 2000500677 T NO 982285 A SE 9504177 A WO 9718744 A1	02-03-1998 18-05-2000 11-06-1997 29-05-1997 23-09-1998 25-01-2000 07-07-1998 24-05-1997 29-05-1997
WO 0027271	A	18-05-2000	US 6206058 B1 US 6142750 A AU 1710800 A AU 1816200 A BR 9915162 A CN 1325363 T EP 1129025 A1 EP 1146809 A2 WO 0027746 A1 WO 0027271 A2 US 2001013381 A1 AU 2346600 A BR 9915766 A CN 1328490 T CZ 20011770 A3 EP 1135214 A1 TR 200101530 T2 WO 0032315 A1 US 6328543 B1 US 2001046407 A1 AU 7716300 A AU 7717100 A AU 7986400 A GB 2363320 A WO 0122861 A2 WO 0123510 A2 WO 0122860 A1	27-03-2001 07-11-2000 29-05-2000 29-05-2000 14-08-2001 05-12-2001 05-09-2001 24-10-2001 18-05-2000 18-05-2000 16-08-2001 19-06-2000 04-09-2001 26-12-2001 13-02-2002 26-09-2001 21-11-2001 08-06-2000 11-12-2001 29-11-2001 30-04-2001 30-04-2001 30-04-2001 19-12-2001 05-04-2001 05-04-2001 05-04-2001
US 5888006	A	30-03-1999	AU 7401998 A EP 0942679 A1 WO 9823200 A1	22-06-1998 22-09-1999 04-06-1998
DE 20003773	U	18-05-2000	DE 20003773 U1	18-05-2000
US 3877103	A	15-04-1975	NONE	
US 4766632	A	30-08-1988	NONE	